



# Why Should you Care about CMMI?

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## Topics

What is CMMI?

The CMMI “Movement”

Why Would You Want to Pay Attention to CMMI?



## What do we typically do when problems in product development arise?

Ignorance  
is bliss



Denial



AIIEEE



Not a good method for problem solving



## Brief Characterization of “CMMI”

CMMI (Capability Maturity Model Integration) is....

- A framework of management, engineering, and support best practices organized into 25 topics, called Process Areas
- An approach to improving the capability of any of the 25 Process Areas by incrementally applying a set of Generic Practices that enhance the functioning of an individual process
- Best thought of as a set of “process requirements” that help guide an organization who is defining and implementing processes related to the 25 topics
- NOT a pre-defined, implementable “as is” process definition



## How is CMMI Different from Other Process Reference Models?

In contrast to most other reference models used for process improvement, CMMI:

- Emphasizes and supports improving processes through *institutionalization* practices
  - These are called generic practices
  - These are practices that can be applied to any process of interest in an evolutionary fashion
- Emphasizes changes in observable behavior
- Emphasizes evolution, not just binary compliance
- Adoption isn't "all or nothing"; pieces of the model can be applied individually to accrue particular business benefits



## What Is Institutionalization?

Institutionalization involves implementing practices that

- Ensure processes can be communicated about (they are defined, documented, understood)
- Ensure the processes are effective, repeatable and lasting
- Provide needed infrastructure support
- Enable organizational learning to improve the process



# Why is Institutionalization Important?

Without institutionalization

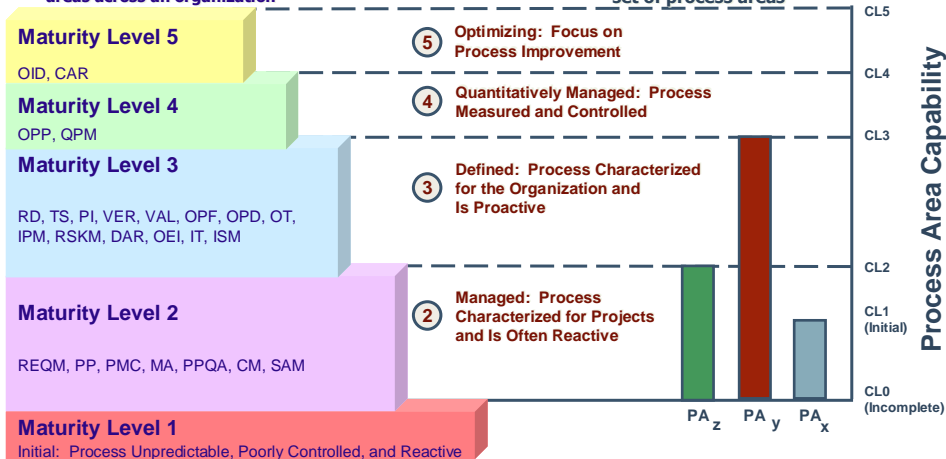
- Process improvement may not relate to business goals
- Processes will not be executed or managed consistently
- The processes will not survive staff or leadership changes
- The organization will find itself continuously “reinventing the wheel”
- Commitment to provide resources or infrastructure to support or improve the processes will be missing or insufficient
- Historical data will not be useful to support future projects



# Model Representations

**Staged**  
...for a pre-defined set of process areas across an organization

**Continuous**  
...for a single process area or set of process areas



*Essentially the Same Content but Organized in a Different Way.*



# CMMI Process Areas

## Staged

Process Areas	
<b>LEVEL 5</b>	Organizational Innovation & Deployment (OID) Causal Analysis and Resolution (CAR)
<b>LEVEL 4</b>	Organizational Process Performance (OPP) Quantitative Project Management (QPM)
<b>LEVEL 3</b>	Requirements Development (RD) Technical Solution (TS) Product Integration (PI) Verification (VER) Validation (VAL) Organizational Process Focus (OPF) Organizational Process Definition (OPD) Organizational Training (OT) Integrated Project Management (IPM) Risk Management (RSKM) Decision Analysis and Resolution (DAR) Organizational Environment for Integration (OEI) Integrated Teaming (IT) Integrated Supplier Management (ISM)
<b>LEVEL 2</b>	Requirements Management (REQM) Project Planning (PP) Project Monitoring and Control (PMC) Measurement and Analysis (MA) Process and Product Quality Assurance (PPQA) Configuration Management (CM) Supplier Agreement Management (SAM)

## Continuous

Process Areas	
<b>Project Management</b>	Quantitative Project Management (QPM) Integrated Project Management (IPM) Risk Management (RSKM) Integrated Teaming (IT) Integrated Supplier Management (ISM) Project Planning (PP) Project Monitoring and Control (PMC) Supplier Agreement Management (SAM)
<b>Process Management</b>	Organizational Innovation & Deployment (OID) Organizational Process Performance (OPP) Organizational Process Focus (OPF) Organizational Process Definition (OPD) Organizational Training (OT)
<b>Engineering</b>	Requirements Management (REQM) Requirements Development (RD) Technical Solution (TS) Product Integration (PI) Verification (VER) Validation (VAL)
<b>Support</b>	Causal Analysis and Resolution (CAR) Decision Analysis and Resolution (DAR) Organizational Environment for Integration (OEI) Measurement and Analysis (MA) Process and Product Quality Assurance (PPQA) Configuration Management (CM)



# Generic Goals And Practices

Level	Generic Goals	Generic Practices
CL 1	GG1: Achieve Specific Goals	GP 1.1: Perform Base Practices
ML 2	GG2: Institutionalize a Managed Process	GP 2.1: Establish an Organizational Policy
		GP 2.2: Plan the Process
ML 3	GG3: Institutionalize a Defined Process	GP 2.3: Provide Resources
		GP 2.4: Assign Responsibility
		GP 2.5: Train People
ML 4	GG4: Institutionalize a Quantitatively Managed Process	GP 2.6: Manage Configurations
		GP 2.7: Identify and Involve Relevant Stakeholders
ML 5	GG5: Institutionalize an Optimizing Process	GP 2.8: Monitor and Control the Process
		GP 2.9: Objectively Evaluate Adherence
		GP 2.10: Review Status with Higher Level Management
		GP 3.1: Establish a Defined Process
		GP 3.2: Collect Improvement Information
		GP 4.1: Establish Quantitative Objectives for the Process
		GP 4.2: Stabilize Subprocess Performance
		GP 5.1: Ensure Continuous Process Improvement
		GP 5.2: Correct Root Causes of Problems



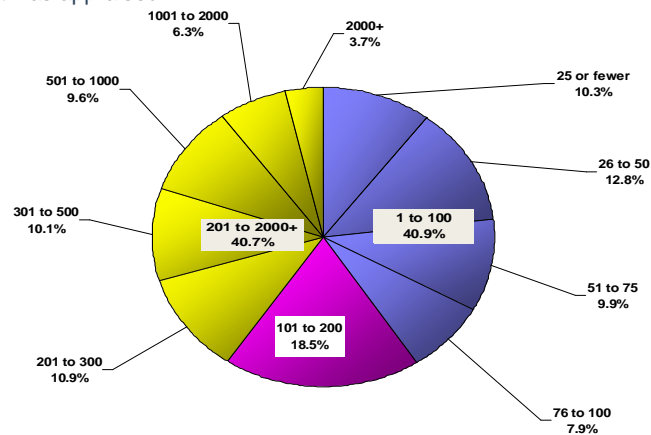
## The CMMI “Movement”

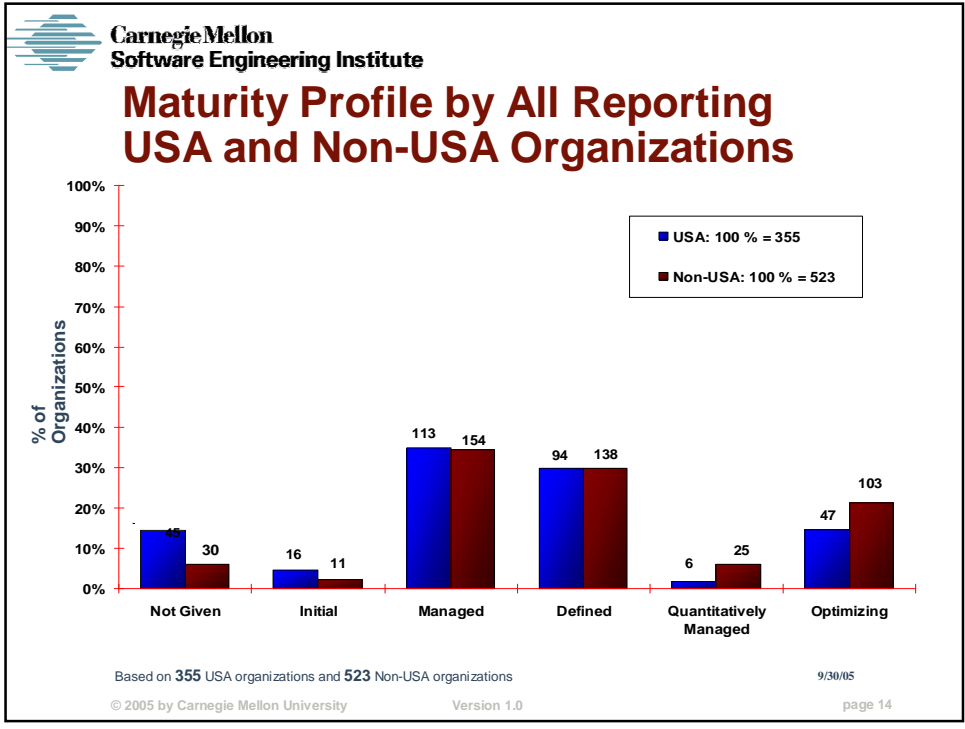
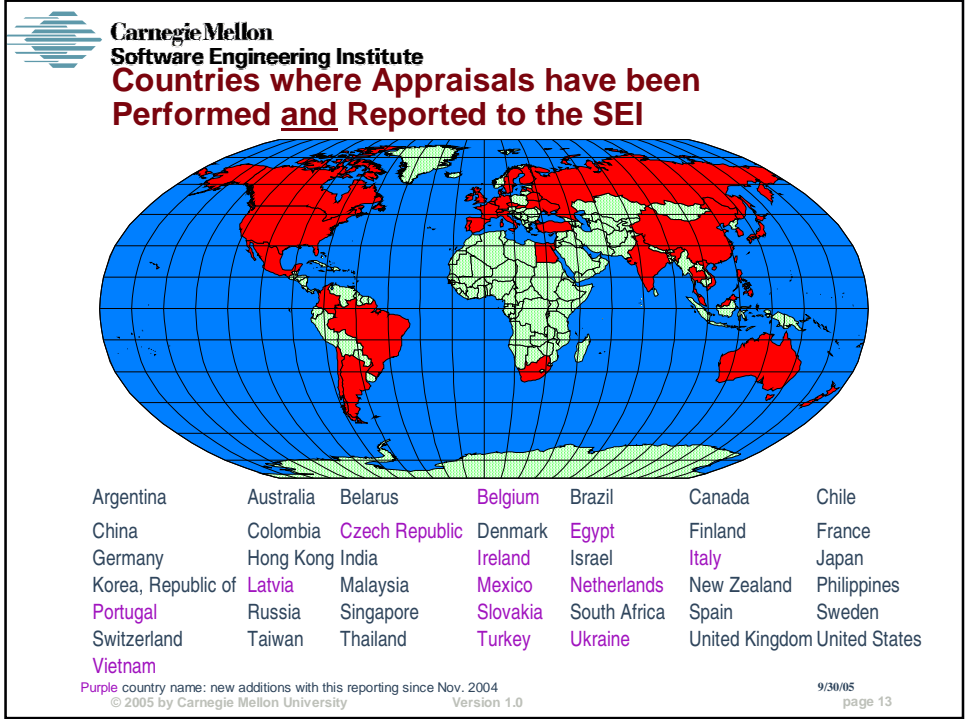
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## Organizational Size

Based on the total number of employees within the area of the organization that was appraised







## **CMMI Transition Status – 9/30/05<sub>1</sub>**

### **Training**

Introduction to CMMI – 38,891 trained  
Intermediate CMMI – 1,738 trained  
Introduction to CMMI Instructors – 372  
SCAMPI Lead Appraisers – 577 trained

### **Authorized**

Introduction to CMMI V1.1 Instructors – 290  
SCAMPI V1.1 Lead Appraisers – 398



## **Why Should You Pay Attention to CMMI?**

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## Performance Results Summary

Improvements	Median	# of data points	Low	High
Cost	38%	14	5%	87%
Schedule	50%	14	20%	90%
Productivity	50%	13	11%	376%
Quality	50%	16	29%	94%
Customer Satisfaction	14%	5	10%	55%
Return on Investment	3 : 1	8	2 : 1	13 : 1

- N = 18, as of 5 March 2005 (out of total N = 26)
- Organizations with results expressed as change over time



## When Project Planning isn't done well...

### What you'll see...

- Poor estimates that lead to cost and schedule overruns
- Unable to discover deviations from undocumented plans
- Resources aren't available/applied when needed
- Unable to meet commitments

### Why Should You Care? Because....

- Customers don't trust suppliers who waste their resources -- loss of future business
- No lessons learned for future projects means making the same mistakes on multiple projects
- Unhappy customers, employees, and stockholders means a short life for the business
- If you fail to plan then you plan to fail!



## **When Project Monitoring and Control isn't done well....**

### **What you'll see**

- Crisis management
- High rework levels throughout the project
- Lots of time spent in meetings trying to "discover" project status rather than reporting on it
- Data needed for management decisions is unavailable when needed
- Actions that should have been taken early on aren't discovered until it's too late

### **Why Should You Care? Because....**

- If you don't know what's going on, corrective action can't be taken early when it's least expensive
- Lack of management insight/oversight makes project results highly unpredictable, even later in the project
- If your confidence in the status you give to your customer is low, they probably perceive that!



## **When Requirements Management isn't done well....**

### **What you'll see:**

- High levels of re-work throughout the project
- Requirements accepted by staff from any source they deem to be authoritative
- "Galloping" requirements creep
- Inability to "prove" that the product meets the approved requirements

### **Why Should You Care? Because....**

- Lack of agreement among stakeholders as to what are the "real" requirements increases time and cost to complete the project
- You're highly likely to deliver an incorrect or incomplete product
- Revisiting requirements changes over and over is a waste of resource highly visible to the customer



## When Configuration Management isn't done well...

### What you'll see:

- Baseline system can't be produced when needed
- Rework during test because components are not what was expected
- Complete inventory of system components unavailable when needed
  - Causes wasted time to find parts and specs and interfaces
- Uncontrolled changes that lead to uncontrolled rework

### Why Should You Care? Because...

- Not knowing what is in the product leads to embarrassing discussions with customers
- Inability to rebuild/revisit a previous baseline wastes money and resources during maintenance
- Not being able to verify that the product tested is the product delivered costs you time, effort, and customer confidence
- If you don't know what's in or out of the product, you don't know what you don't know!



## When Requirements Development isn't done well...

### What you'll see:

- Unstated requirements, poorly stated requirements that lead to confusion among staff and customers
- Design, implementation, and test work products that inconsistently interpret the requirements
- Inordinately long time to get to agreement on product design

### Why Should You Care? Because...

- Unusable products and unhappy customers lead to loss of future business
- Wasted time and resources building product to requirements that customer may not want threatens your profitability
- Staff get tired of re-doing work because the requirements have been re-interpreted "yet again"
- The potential for excessive spending to meet customer expectations increases when you don't identify requirements well



## I could go on.....

Backup slides contain similar slides for several other CMMI PAs, for when you can't sleep at night....

How does CMMI help overcome these kinds of problems?

- If you have no clue how to get started
  - Staged representation gives you a suggestion of what things other organizations have found helpful to work on first
- If you have a good handle on your business goals
  - You can use the Continuous representation to create a customized improvement program that aligns with your business goals
- In either case
  - The practices in the Process Areas plus the Generic Practices provide a framework for an ongoing process of continuous improvement



## Backup Slides



## **When Process and Product Quality Assurance aren't done well...**

### **What you'll see:**

- No assurance is available that quality standards are followed or achieved
- Poor quality work products being produced
- Ineffective processes that staff avoid using
- No accountability for not following process or meeting standards
- Significant project issues are not escalated for management attention

### **Why Should You Care? Because...**

- Loss of management insight into development process can cause significant issues to be missed
- Poor quality interim products reduce customer's confidence that you can provide a high quality delivered product
  - You're likely to lose that customer's business in future



## **When Supplier Agreement Management isn't done well...**

### **Symptoms:**

- Sub-optimal Supplier selection– not based on the right criteria
- Integration of supplier products into product baseline is problematic
- Management and technical staff do not have insight into supplier's activities
- Supplier issues are not uncovered in a timely manner
- Supplier products are accepted even when they don't meet the product requirements

### **Why Should You Care? Because....**

- A supplier can make or break your project
- You are ultimately responsible to your customer for supplier performance



## When Measurement and Analysis isn't done well...

### What you'll see:

- Measurements unknowingly used inappropriately/ out of context
- Management by perception/judgment vs. by fact
- Measurement presentations being used to confuse rather than enlighten
- Useless measures being collected

### Why Should You Care? Because...

- Poor decisions that cannot be justified reduce customer and staff confidence
- Collected measures don't allow you to quantify how close you are to meeting your business goals
- Having no valid basis for prioritizing improvements could lead you to significant wasted overhead time, effort, money
- High risk for not meeting customer expectations wrt. delivery/quality of product



## When Technical Solution isn't done well...

### What you'll see:

- Less than optimal solution is "settled on"
- Products that don't meet technical performance requirements and/or user needs
- Increased testing/rework to resolve design/architecture issues
- Customer is surprised at the solution that resulted from their requirements

### Why Should You Care? Because...

- Increased cost to test and to address rework
- Future business is at risk with the customer if performance expectations aren't met
- Product may not be able to accommodate technology upgrades and future growth if technical solution isn't well conceived



## When Product Integration isn't done well.....

### What you'll see:

- Subsystems don't operate together
- Increased integration/test time
- Building test harnesses/procedures/etc late in the project
- Integration environment is inadequate to support the integration activities

### Why Should You Care? Because.....

- You can't release the system until it operates as a unit
- You'll spend more time in integration/test than you planned/can afford
- You can't accurately estimate integration-related costs, reducing your customer's confidence
- There's nothing quite as embarrassing as installing a product that doesn't integrate with the customer's system



## When Verification isn't done well.....

### What you'll see:

- Disagreement among technical staff as to the "done-ness" of different components
- Product under test doesn't meet requirements/design expectations
- Defects that could have been caught early escape into later life cycle phases
- Increased integration/test time

### Why Should You Care? Because.....

- Product reliability suffers if defects aren't detected/ corrected prior to customer release
- Product costs more to test if early verification activities are ignored
- Customers don't want to pay for defective products
  - You probably won't get their business next time



## **When Validation isn't done well.....**

### **What you'll see:**

- Lots of user change requests before/soon after the product is released
- Arguments among the technical staff as to what the user "really" wants
- Released product doesn't meet user expectations

### **Why Should You Care? Because.....**

- Customers don't want to pay for products that don't meet their needs
- If an end user refuses to use the product as delivered, their confidence in you is eroded
  - You'll spend a lot of money trying to "make it right" or you'll give up that customer's future business



## **When Organization Process Focus isn't done well.....**

### **What you'll see:**

- Lots of staff changes in the Engineering Process Group or equivalent
- Lack of visible senior management support for process improvement activities
- The things that are chosen for improvement are not aligned with business priorities
- False starts and rocky implementations of improvement efforts

### **Why Should You Care? Because.....**

- Each time the organization visibly fails at improvement, the harder it is to get support the next time
- Lack of alignment with business priorities means lots of overhead money gets wasted
- If the organization can't effectively support improvement, employee pride in their work is eroded when they can't meet customer expectations
- Employees will only tolerate so many "improvements" that don't work before they look for another job





## When Organization Process Definition isn't done well.....

### What you'll see:

- Staff resist using the guidance in the standard processes that have been defined
- "Mother of all process manuals" sits on the real (or virtual!) shelf
- Lots of time being spent getting process waivers
- Extreme amount of tailoring requested by each project

### Why Should You Care? Because.....

- Since defining processes is an overhead task, defining processes that can't be used/cause lots of work to "get around" is a direct waste of profit
- Using processes that are ineffective can cause many of the other symptoms we've discussed
- Staff who lack confidence in the organization's ability to provide useful guidance will probably look elsewhere for jobs
- Lots of tailoring leads to less and less reuse of process knowledge and skills, thus reducing your ROI in process definition activities



## When Organizational Training isn't done well.....

### What you'll see:

- Staff attending training courses they don't need
- Staff avoiding training that is provided
- Inappropriately-skilled staff being assigned to tasks, often without knowledge of the deficiency
- Staff aren't released to attend training they do need

### Why Should You Care? Because.....

- You compromise your competitive edge if staff are not appropriately skilled for the tasks you're competing for
- Staff who get frustrated at not getting the training they need may look elsewhere for a job
- Customer confidence is eroded when they find out that inappropriately-skilled staff are assigned to their project
- The productivity difference between highly skilled/unskilled staff (at least in software) is documented at 27:1<sup>1</sup>

<sup>1</sup>Capers Jones, *Software Quality & Productivity*



## When Integrated Project Management isn't done well.....

### What you'll see:

- Unclear responsibilities across functional area boundaries
- No integrated master schedule is available to guide the stakeholders of the project
- Data/artifacts to support future similar projects aren't available when needed
- Relationship of project's process/plans to organizational standards is unclear

### Why Should You Care? Because.....

- Managing a "stovepiped" project increases the time/effort needed to assure that all the requirements are being met
- Different stakeholders stepping on each other's toes is a huge waste of time/effort/money
- The customer will see different perspectives, status, etc from different elements of the same project
- You may be the project manager for the "next" project and will need all the help you can get from past projects
- You may be using less effective processes than the organization knows about through its standard processes



## When Risk Management isn't done well...

### What you'll see:

- Idealistic approach that assumes "all is well" even when there is evidence that all is NOT well
- Issues that are known risks to project staff are a surprise to management
- Every time a new problem manifests, a new management technique is tried

### Why Should You Care? Because...

- The project may escape some of the "bullets", but not all
- No lessons learned for future projects means making the same mistakes on multiple projects
- Repeated project failures due to the realization of unforeseen (but predictable!) risks costs you business, if not the whole company



## **When Decision Analysis & Resolution isn't done well.....**

### **What you'll see:**

- Unclear who is authorized to make what decisions
- Decisions are made on primarily subjective basis
- Same issue is "decided" over and over and over.....
- Rationale for earlier decisions is unavailable when needed to understand the decision later in the project
- Only a few choices considered for major decisions

### **Why Should You Care? Because.....**

- Decisions getting made without all the relevant factors being considered usually costs time or money later on
- Missing a more optimal solution can cost you time, money, credibility, perhaps even the whole project
- Revisiting decisions, digging up rationale, undoing decisions reduce customer confidence in your expertise and technical ability to serve their needs