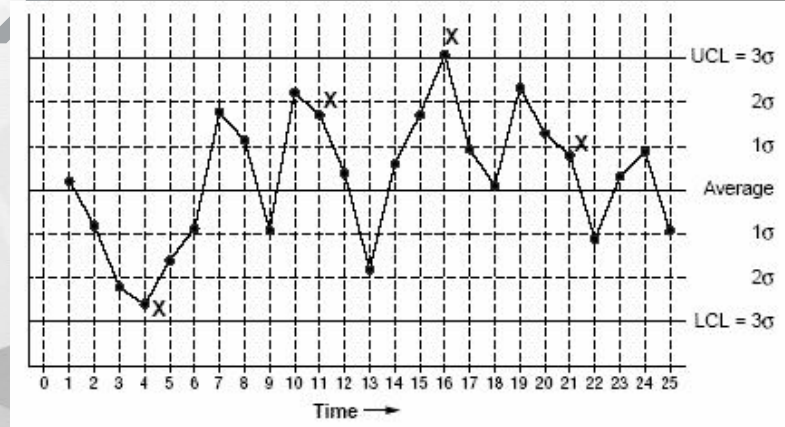
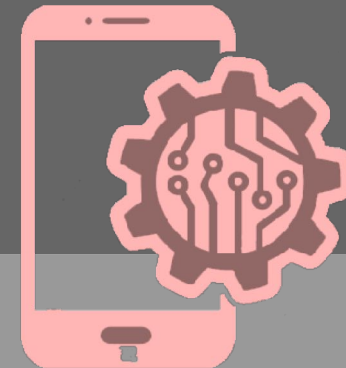




• Capability Maturity Model Integration (CMMi)



Definitions

- Capability

Ability to do something

- Maturity

Full level of development

- Process

A series of actions or steps taken in order to achieve a particular task.

- Process capability?

The range of results that can be achieved by following a particular process is the process capability

- Process maturity?

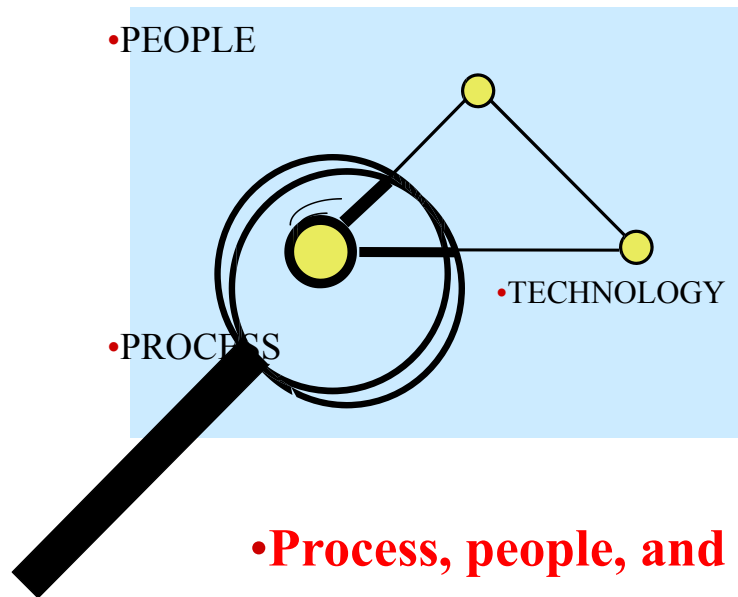
The extent to which a process is well defined, implemented and controlled is process maturity.

Symptoms of Process Failure

- Commitments consistently missed
 - Late delivery
 - Last minute crunches
 - Spiraling costs
 - No management visibility into progress
 - You're always being surprised
 - Quality problems
 - Too much rework
 - Functions do not work correctly
 - Customer complaints after delivery
 - Poor morale
 - People frustrated
 - Is anyone in charge?
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Quality Leverage Point

- While process is often described as a node of the process-people-technology triad, it can also be considered the “glue” that ties the triad together.



Everyone realizes the importance of having a motivated, quality work force but even our finest people cannot perform at their best when the process is not understood or operating at its best.

- **Process, people, and technology are the major determinants of product cost, schedule, and quality.**



• Common Misconceptions

- I don't need process, I have
 - really good people
 - advanced technology
 - an experienced manager
- Process
 - interferes with creativity
 - equals bureaucracy + regimentation
 - isn't needed when building prototypes
 - is only useful on large projects
 - hinders agility in fast-moving markets
 - costs too much

CMMI for Process Improvement

- A CMMI model is not a process.
- A CMMI model describes the characteristics of effective processes.

• “All models are wrong,
but some are useful.”

George Box

• (Quality and Statistics
Engineer)



How Do You Want to Work?



Random motion – lots of energy, not much progress

No teamwork – individual effort

Frequent conflict

You never know where you'll end up



Directed motion – every step brings you closer to the goal

Coordinated efforts

Cooperation

Predictable results

Processes can make the difference!



Software Engineering Institute

Carnegie Mellon

CMMI V1.3 and Beyond
Phillips – August 2010

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An Immature Process

- Ad hoc: process improvised by practitioners and their management
- Not rigorously followed or enforced
- Highly dependent on current practitioners
- low visibility into progress and quality
- Use of new technology risky
- Quality difficult to predict

Common Misconceptions

I don't need process, I have ...

- Really good people
- Advanced technology
- An experienced manager

Process...

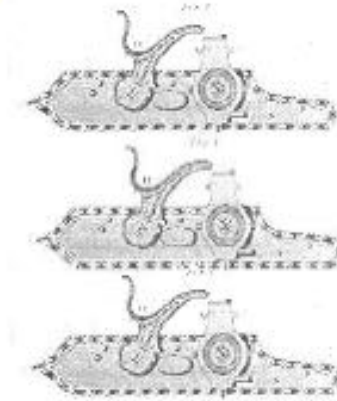
- Interferes with creativity
- = bureaucracy + regimentation
- Is only useful on large projects
- Hinders agility in fast-moving markets
- Costs too much



How Can Process Help?

Process supports the goals of the company, enabling

- Repeatability
- Insight and oversight
- Control and tracking
- Measurement
- Improvement
- Training
- Transformation (via consistency, integration, coordination)



Interchangeable
parts

CMMI Philosophy

- The quality of a software system is highly influenced by the quality of the process used to develop and maintain it

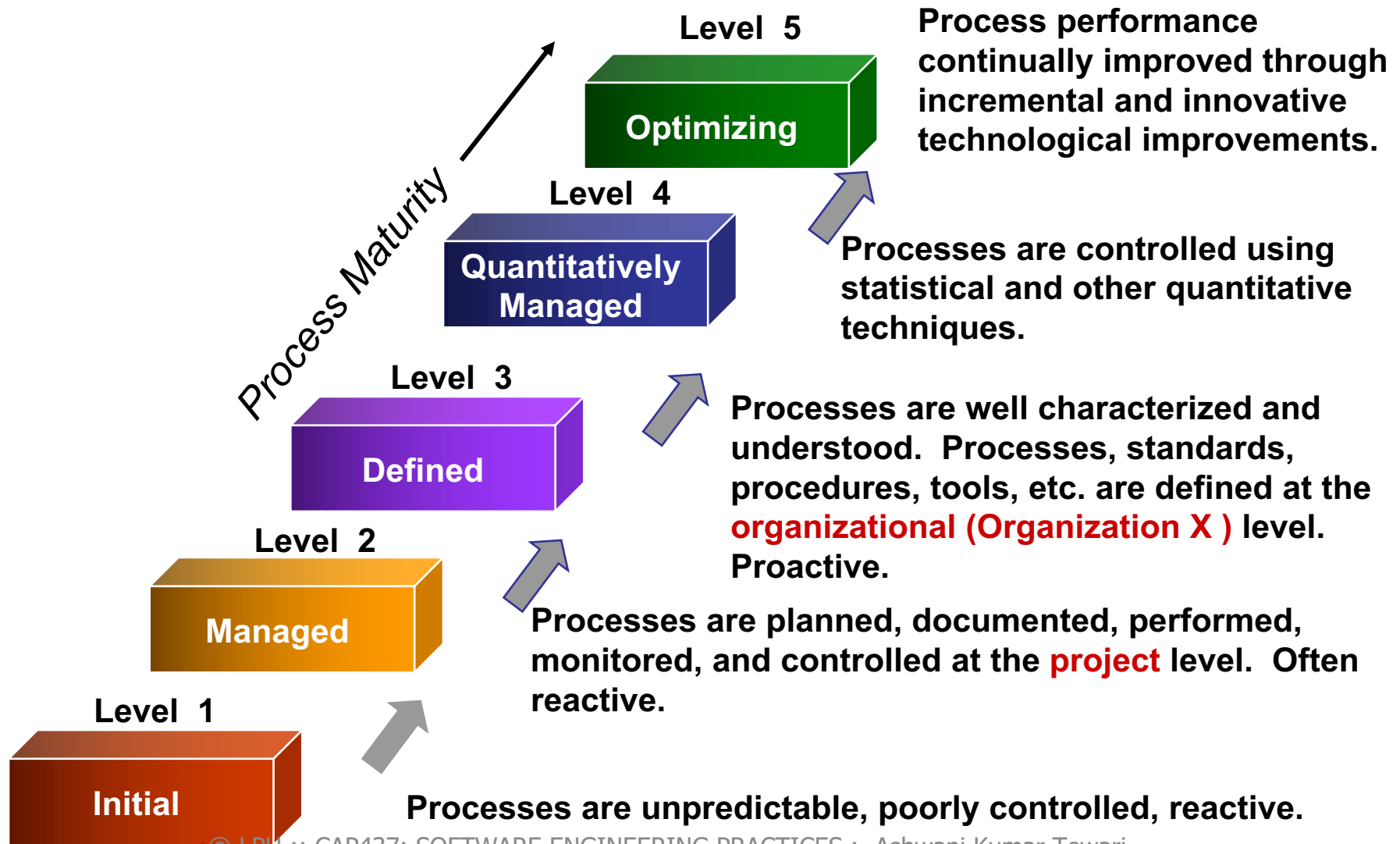
CMMI

- CMMI is a process improvement model that provides best practices that addresses productivity , performance, cost and stakeholder satisfaction.

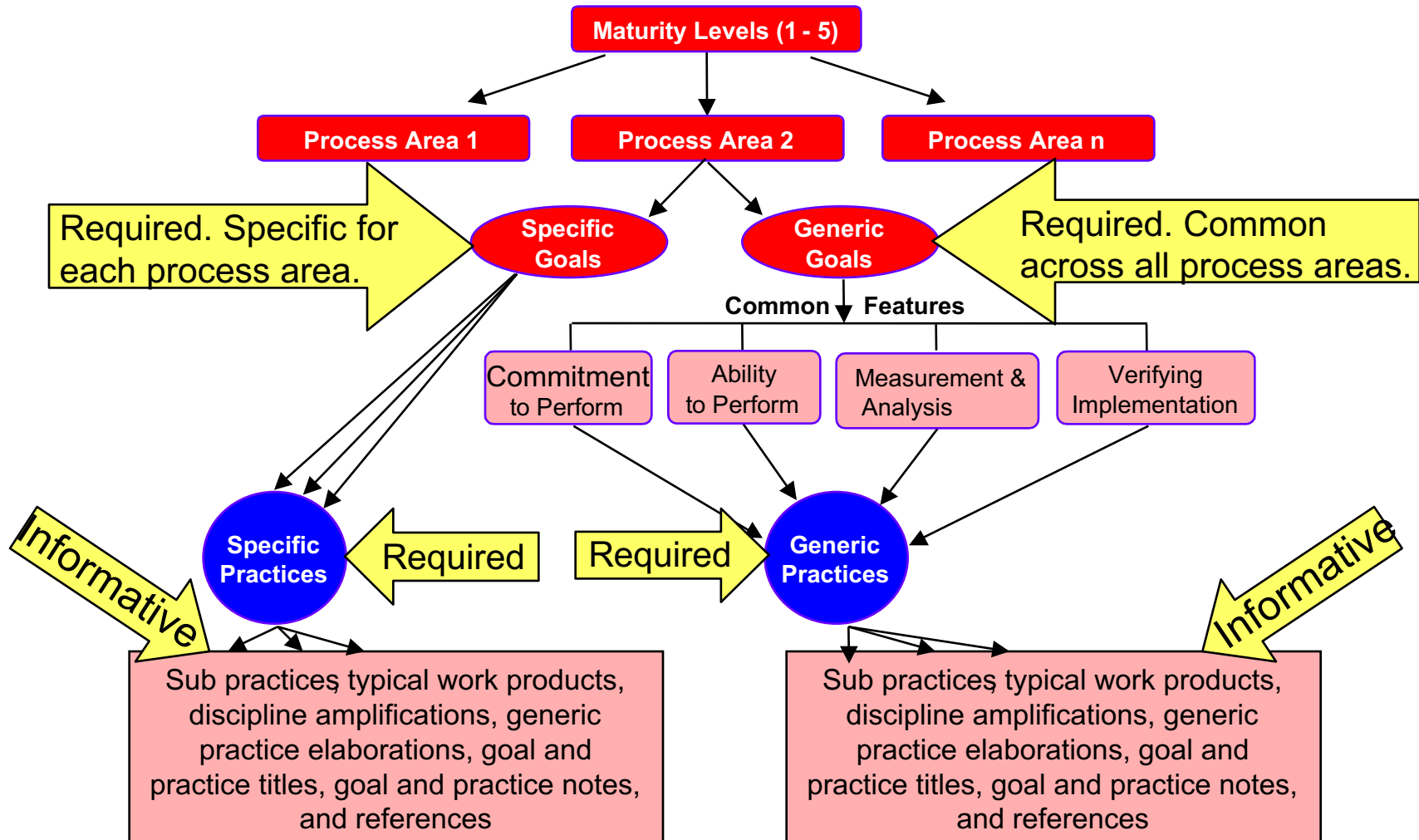
What is CMMI?

- CMMI (Capability Maturity Model Integration) is a proven industry **framework** to improve product quality and development efficiency for **both** hardware and software
 - Sponsored by US Department of Defence in cooperation with Carnegie Mellon University and the Software Engineering Institute (SEI)
 - Many companies have been involved in CMMI definition such as Motorola and Ericsson
 - CMMI has been established as a model to improve business results
- CMMI, staged, uses 5 levels to describe the maturity of the organization

CMMI Staged Representation - 5 Maturity Levels






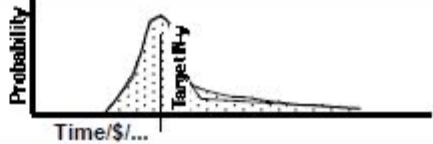

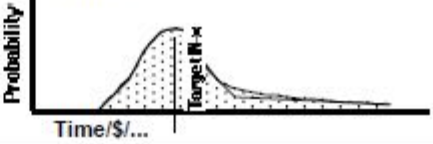

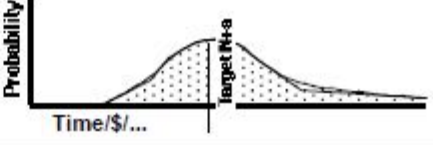

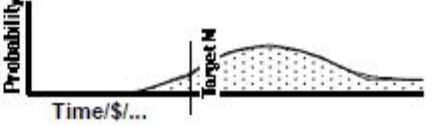
CMMI Terminology & Structure



Behaviors at the Five Levels

Maturity Level	Process Characteristics	Behaviors
5 Optimizing	Focus is on continuous quantitative improvement	Focus on "fire prevention"; improvement anticipated and desired, and impacts assessed.
4 Quantitatively Managed	Process is measured and controlled	Greater sense of teamwork and inter-dependencies
3 Defined	Process is characterized for the organization and is proactive	Reliance on defined process. People understand, support and follow the process.
2 Managed	Process is characterized for projects and is often reactive	Over reliance on experience of good people – when they go, the process goes. "Heroics."
1 Initial	Process is unpredictable, poorly controlled, and reactive	Focus on "fire fighting"; effectiveness low – frustration high.

Evolution of Process Capability

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



Maturity Level 1 Initial

- Maturity Level 1 deals with **performed** processes.
- Processes are unpredictable, poorly controlled, reactive.
- The process performance may not be stable and may not meet specific objectives such as quality, cost, and schedule, but useful work can be done.

Maturity Level 2

Managed at the Project Level

Process Areas

- Requirements Management
- Project Planning
- Project Monitoring and Control
- Supplier Agreement Management
- Measurement and Analysis
- Process and Product Quality Assurance
- Configuration Management

Maturity Level 3

Defined at the Organization Level

- Requirements Development
- Technical Solution
- Product Integration
- Verification
- Validation
- Organizational Process Focus
- Organizational Process Definition
- Organizational Training
- Integrated Project Management
- Risk Management
- Decision Analysis and Resolution

Maturity Level 4 QUANTITATIVELY MANAGED

- Organizational Process Performance
- Quantitative Project Management

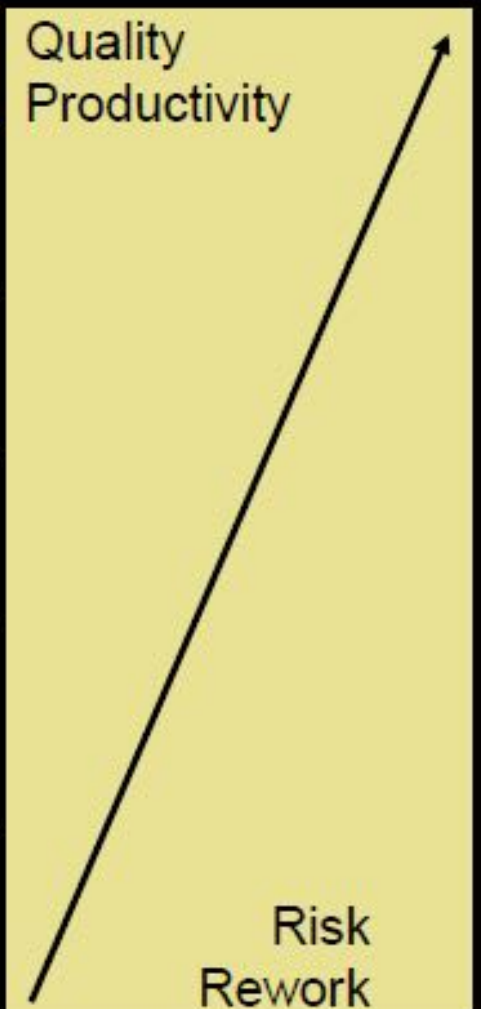
Maturity Level 5 OPTIMIZING

- Organizational Innovation and Deployment
- Causal Analysis and Resolution

CMMI Process Areas

Maturity Level	Project Management	Engineering	Process Management	Support
5 Optimizing			Organizational Innovation & Deployment	Causal Analysis & Resolution
4 Quantitatively Managed	Quantitative Project Mngt		Organizational Process Performance	
3 Defined	Integrated Project Mngt Risk Management	Requirements Development Technical Solution Product Integration Verification Validation	Organizational Process Focus Organizational Process Definition Organizational Training	Decision Analysis & Resolution
2 Managed	Project Planning Project Monitoring & Control Supplier Agreement Mngt	Requirements Mngt		Measurement & Analysis Process & Product Quality Assurance Configuration Mngt
1 Initial				

PAs by Maturity Level

Level	Focus	
5 Optimizing	<i>Continuous Process Improvement</i>	
4 Quantitatively Managed	<i>Quantitative Management</i>	
3 Defined	<i>Process Standardization</i>	
2 Managed	<i>Basic Project Management</i>	
1 Initial		

Example

For the Requirements Management Process Area:

An example **Goal** (required):

“Manage Requirements”

An example **Practice** to support the Goal (required):

“Maintain bi-directional traceability of requirements”

Examples (suggested, but not required) of typical **Work Products** might be

Requirements traceability matrix or

Requirements tracking system

Yet another CMMI term: Institutionalization

- This is the most difficult part of CMMI implementation and the portion where managers play the biggest role and have the biggest impact
- Building and reinforcement of corporate culture that supports methods, practices and procedures so they are the ongoing way of business.....
 - Must be able to demonstrate institutionalization of all CMMI process areas for all organizations, technologies, etc.
- Required for all Process Areas

Process Improvement

Whether intentional or not, you already have processes in place. Are they the RIGHT processes?

Something is wrong...

- ... if no one uses the processes (except under duress)
- ... if everyone has their own interpretation of the process
- ... if you find you are **always** tailoring your processes



CMMi Benefits

- CMMI-based process improvement benefits include
 - improved schedule and budget predictability
 - improved cycle time
 - increased productivity
 - improved quality (as measured by defects)
 - increased customer satisfaction
 - improved employee morale
 - increased return on investment
 - decreased cost of quality