



***NORTHROP GRUMMAN***

# **The True Costs and Benefits of CMMI Level 5**

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# Background

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- A debate is currently raging in the acquisition community: Does CMMI Level 5 benefit the customer?
- Several recent program failures from organizations claiming high maturity levels have caused some to doubt whether CMMI improves the chances of a successful project
  - Is the CMMI Level 5 flawed?
  - Or is there a more fundamental explanation?
- This presentation will discuss guidelines for appropriate use of CMMI in acquisition and the true costs and benefits of CMMI Level 5

# Agenda



- Underlying CMMI principles
- CMMI relationship to productivity, predictability and speed
- Cost of implementing CMMI-compliant processes
- Timelines for impacting program performance
- Practical tips and techniques for realizing the benefits

*SM SCAMPI, SCAMPI Lead Appraiser, and SEI are service marks of Carnegie Mellon University.  
® Capability Maturity Model Integration and CMMI are registered in the U.S. Patent & Trademark Office.*

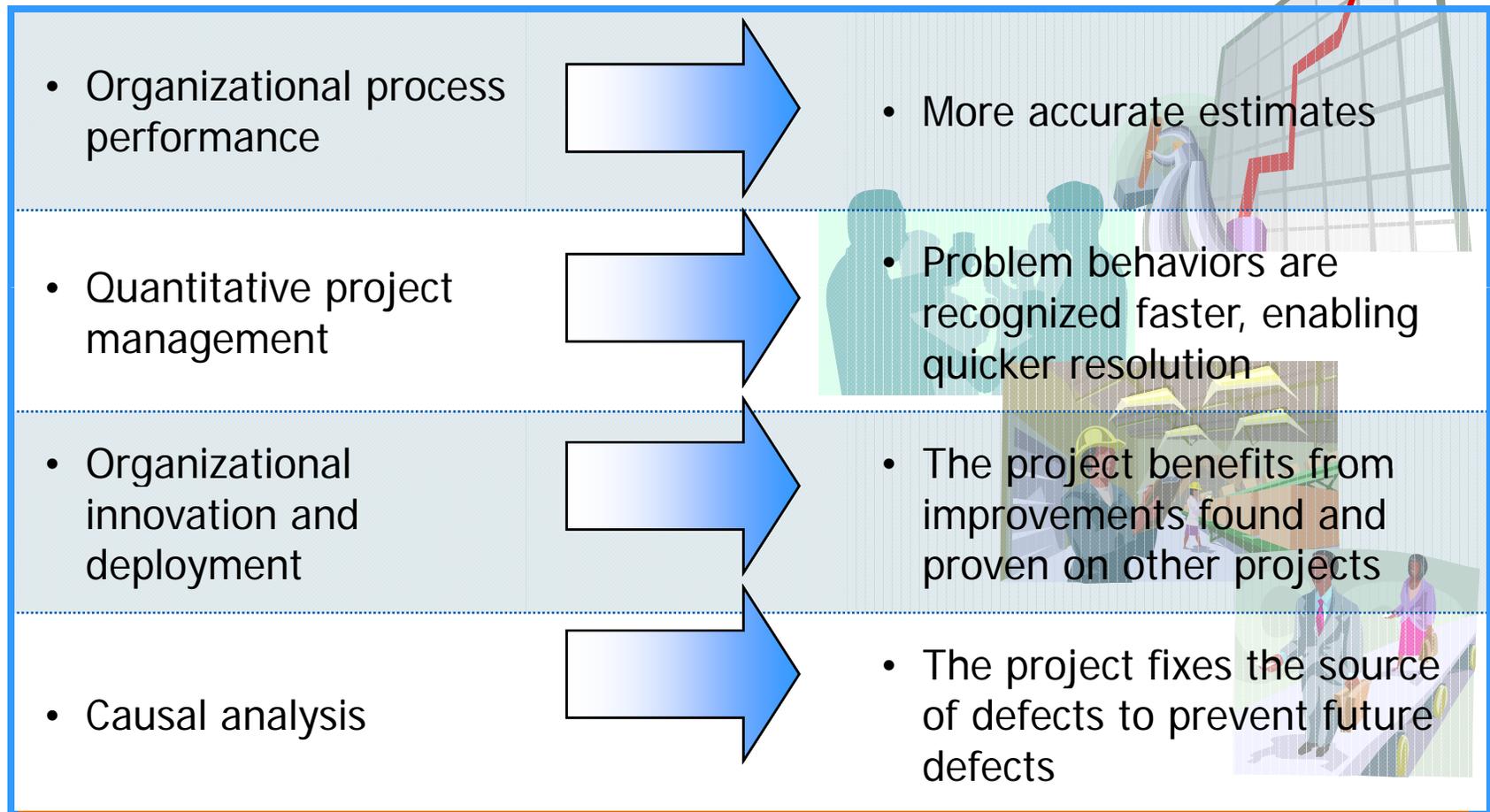
# What Is the CMMI Trying to Achieve?

*A model is a simplified representation of the world. Capability Maturity Models (CMMs) contain the essential elements of effective processes for one or more bodies of knowledge. These elements are based on the concepts developed by Crosby, Deming, Juran, and Humphrey.*

*-Introduction, CMMI*

- CMMI provides a model of industry best practices
- Following these practices has shown to produce software and systems faster, better, and cheaper, when properly applied
- The main benefits cited by CMMI users are:
  - More predictable adherence to budgets and schedules
  - Reduced re-work (which can reduce cost and schedule)
  - Reduced risk

# How Does Levels 4 & 5 Benefit the Customer?

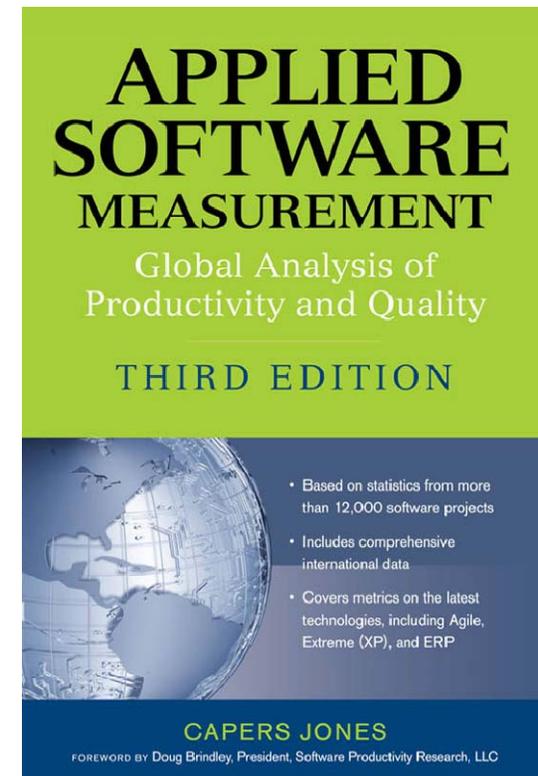


*Level 5 reduces costs and improves quality (so we implement it on all projects)*

# Quantitative Benefits of CMMI Level 5

## Approximate Productivity Rates by Size of Application

Function Points	1K	10K	100K
TSP/PSP + Scrum	15.75	10.00	9.00
CMM 5 + Six-Sigma	13.00	9.75	9.25
TSP/PSP	14.25	9.50	8.00
CMM Level 5	12.50	9.25	7.75
Six-Sigma for software	9.00	9.00	7.20
CMMI	11.25	8.25	7.50
CMM Level 3	9.50	7.25	4.50
Agile/Scrum	23.00	7.00	5.25
CMM Level 1	6.50	1.50	1.25



# Barriers and Challenges

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- Engineering process measurements are often difficult to analyze
  - Inherent process variations when human creativity is involved
  - Dirty (or no) data
  - Vague measurement definitions, human recording errors
  - Infrequent measurements
  - Non-normal data
  - Need for stratification/aggregation
- Must demonstrate the value of quantitative data to managers
  - Management style - reactive vs. proactive vs. quantitative
  - Less value in a chaotic environment
  - Must involve customers

# When Good Organizations Go Bad

- Some organizations are driven to achieve a maturity level only for it's marketing value

**Improvement goals are not set realistically**

**Focus on passing the appraisal, not understanding and deciding among possible interpretations**

**Only some of the projects participate in the improvement effort**

**Practitioners/customers perceive CMMI as more expensive**

**Only some of the projects get appraised**

**The remaining projects don't implement**

**Insufficient resources (e.g., training, QA, metrics, consultants)**

**People don't learn or become proficient in the new behaviors**

**Management doesn't enforce using processes on new programs**

**Benefits are not realized because projects do not start up effectively**

# What Does a CMMI Level Guarantee?

*Decisions made on the basis of maturity level ratings are only valid if the ratings are based on known criteria.*

*- SCAMPI A Method Description Document*

- A CMMI appraisal indicates the organization's capacity to perform the next project, but cannot guarantee that each new project will perform in that way
- The CMMI methodology assumes the organization will propagating their processes to every new project
  - An organization that gets appraised solely to demonstrate a maturity level might not have that intent
  - Organizations may not have developed the skills to roll out their processes effectively
- A CMMI appraisal judges the maturity of the organization's processes – based upon the projects sampled
  - New projects must embrace the new processes

# Where Could Problems Arise?

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- The appraisal results may not be an accurate reflection of the organization's capability
  - Sampling bias
  - Appraisal inaccuracies
  - Organization's inability to immediately apply their appraised processes
- The projects within the organization may not live up to their capability
  - Start-up problems, especially planning, subcontractors, and infrastructure
  - Problems with staffing, either as the prime or with subcontractors
  - Differences in domain experience
  - Back-sliding
- The customer may prevent (or fail to demand) the supplier's use of their proven processes

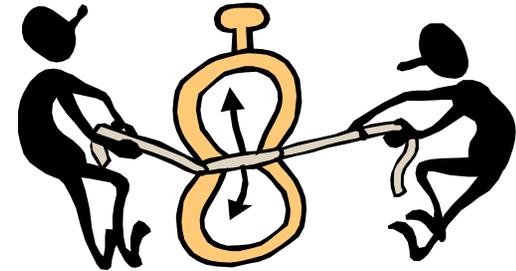
# Appraisal Inaccuracies

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- Methodology
  - SCAMPI A appraisals provide highly accurate appraisal results
  - SCAMPI B, C, and other appraisal methods may be useful, but they are not designed to provide the same accuracy
- Appraiser skill
  - There is wide variation in appraiser skill, experience and insight
  - Although appraisal experience is a crucial contributor to accuracy, the appraisal methods do little to ensure sufficient experience – method, type of organization
  - There is wide variation in how the model is interpreted, even among experienced lead appraisers
- Appraiser independence
  - Appraiser independence is needed to ensure unbiased results
  - It is difficult to establish a completely independent situation

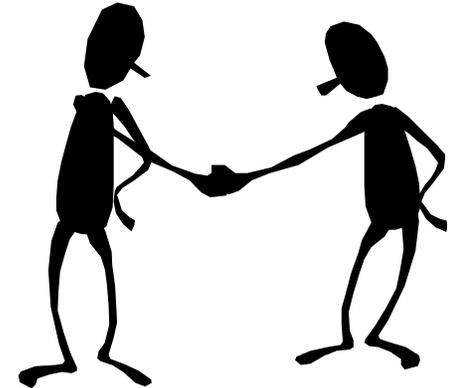
# The First Three Months: Essential Project Start-Up Activities

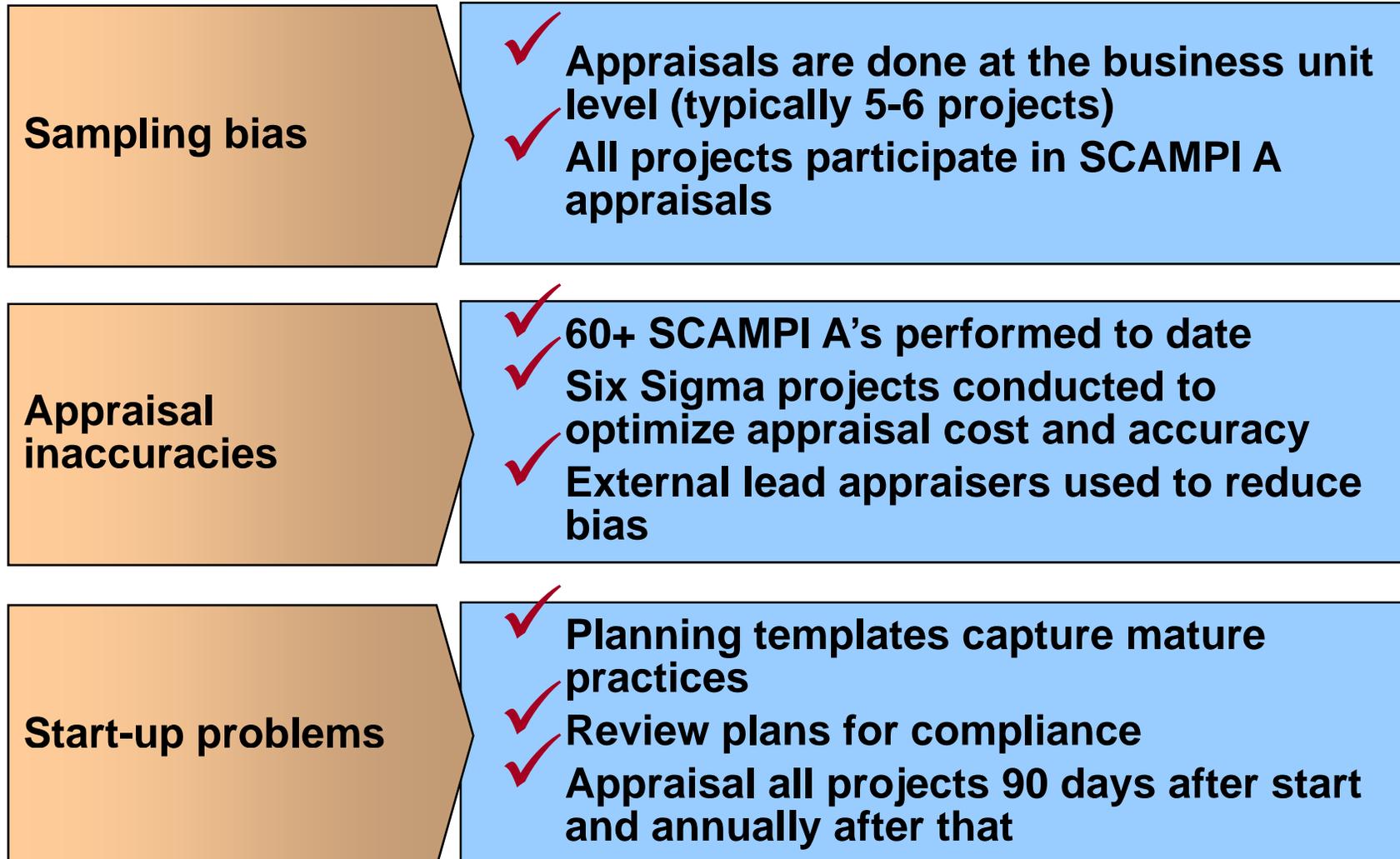
- Many process-related problems arise in the first few months of a project
  - New relationships
  - Personnel changes and shortfalls
  - Pressure to produce quickly
  - Gaps between the planned processes and what was bid
- If a project is going to live up to the organization's process capability, it is essential to fully implement the processes from the beginning
  - Processes should be defined during the proposal, by tailoring the organization's standard process
  - Estimates should be based on historical data from the organization's measurement repository
  - Process assets (e.g., templates) should support detailed planning to ensure consistency with the organization's best practices
  - Evidence reviews should be used early to ensure CMMI compliance



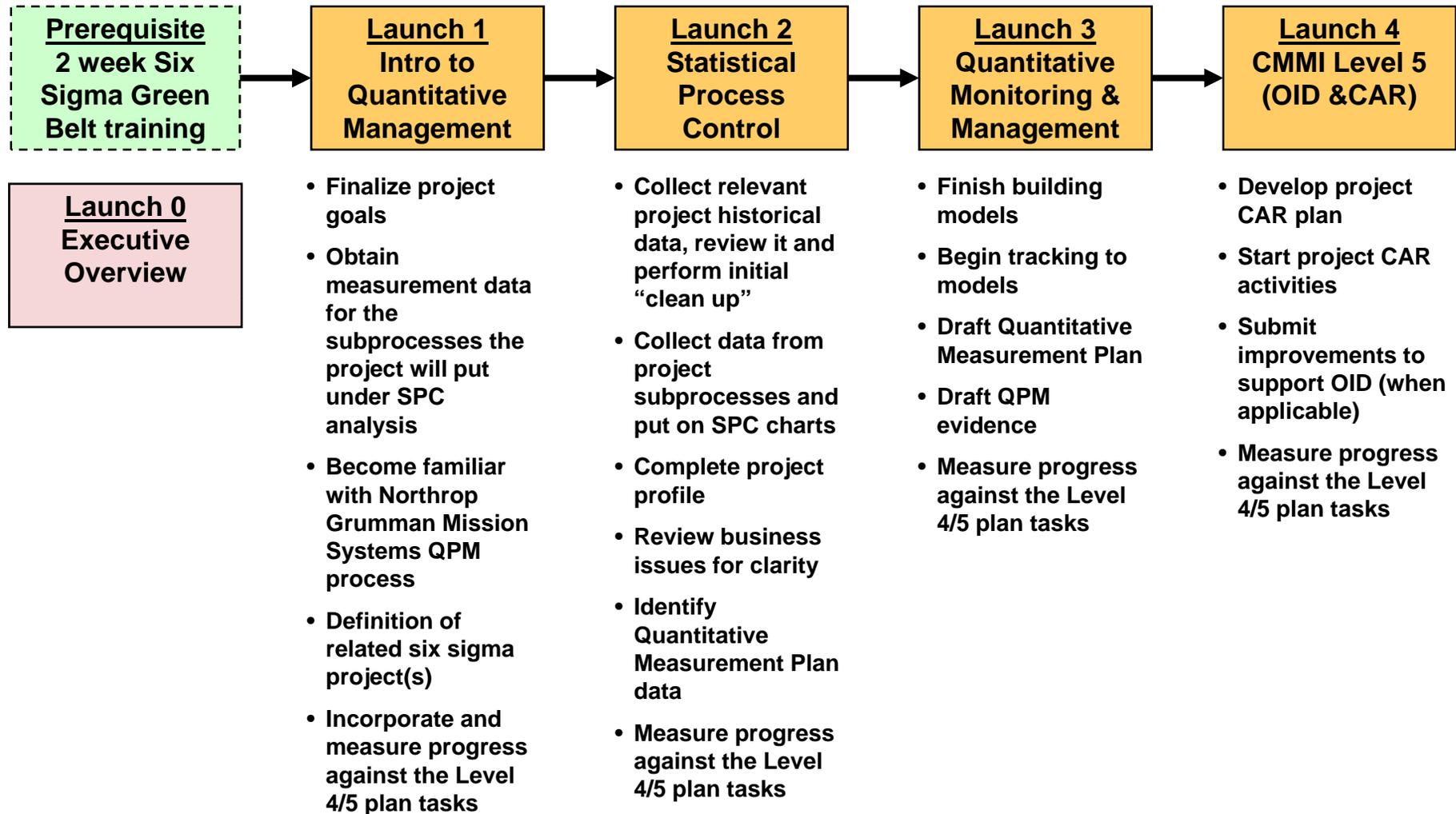
# Getting the Promised Benefits from a CMMI-Compliant Supplier

- Choose the supplier wisely
- Let (demand) the supplier implement CMMI-compliant processes
  - Recognize your personal experience with the processes may have been negative
  - However, the model (based on hundreds of people's/organizations' opinions and data) suggests these processes are essential
  - Ask the supplier to explain how their implementation of these processes provides value
- Ensure the supplier uses the processes, at program start and throughout the program
  - Ask how program start-up is controlled to ensure CMMI compliance
  - Demand an independent appraisal 3 months into the program
  - Demand continuous appraisals, at least annually

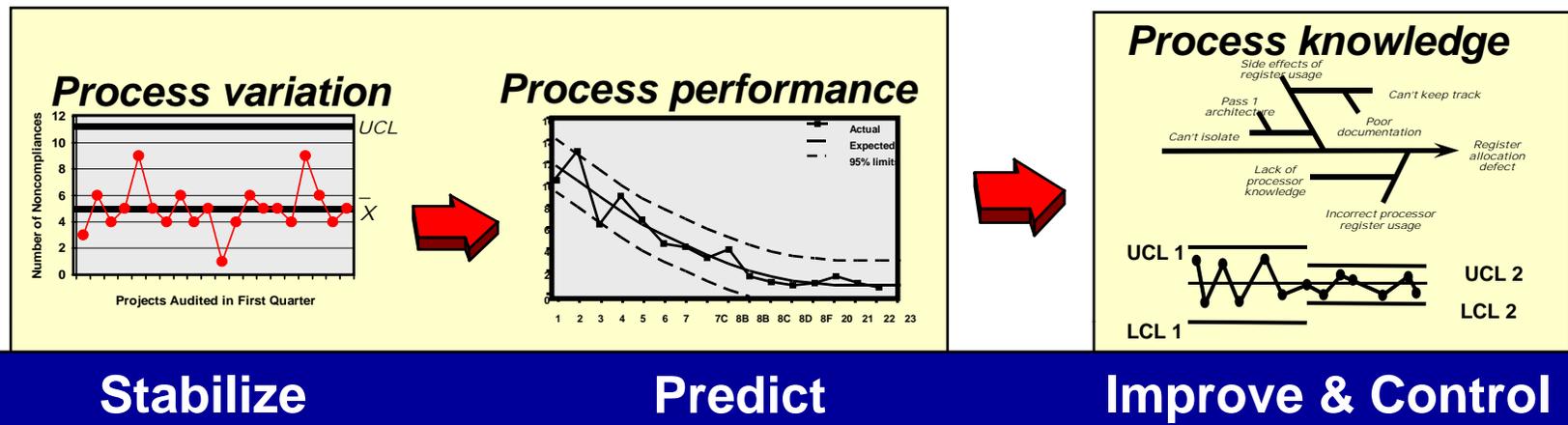




# Northrop Grumman Launch Workshop Strategy



# Lean Six Sigma Provides the Needed Tools to Implement CMMI High Maturity



## Level 4

- Understand project's **process capabilities** based on process performance baselines
- **Control process variation** (remove "assignable causes")
- **Predict results** using process performance models
- **Manage** to achieve **goals**

## Level 5

- Base **improvement goals** on future business needs
- **Eliminate problem and defect causes** ("common causes")
- Select, predict, and measure improvements to **change the process performance** baselines - shift the mean; tighten the variance
- **Manage change**

# Lessons Learned

## Based on over 20 Northrop Grumman CMMI Level 5 organizations

- CMMI and Six Sigma compliment each other
  - CMMI can yield behaviors without benefit
  - Six Sigma improvements based solely on data may miss innovative improvements (assumes a local optimum)
- Having multiple improvement initiatives helps encourage a change in behavior as opposed to “achieving a level”
  - Reinforces that change (improvement) is a way of life
- The real ROI comes in institutionalizing local improvements across the wider organization
  - CMMI establishes the needed mechanisms
- Training the staff as Six Sigma Green Belts has resulted in a change of language and culture
  - Voice of Customer, data-driven decisions, causal analysis, etc.
  - Better to use the tools in everyday work than to adopt the “religion”

# Summary

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- CMMI benefits can be achieved for all the projects within an organization if the focus is on true improvement and institutionalization
- The organization must ensure:
  - Project start-up takes full advantage of the organization's capability
  - Appraisal accuracy is maintained
- Acquirers must work with suppliers to ensure the promised benefits of CMMI are realized



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