

**Case Study: Realizing 40% Software
Development Productivity Improvements
Using RUP, Agile, CMM/CMMI, and
Organizational Transformation Methods**

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Agenda

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2. Business Rationale For Improvement
3. Pre-existing Obstacles
4. Approach
 - Organizational Transformation Techniques
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 - RUP
 - Agile Methods
5. Benefits
6. Wrap Up

1: Introductions and Background

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Your Presenters

- Rick Lien
 - StorageTek Quality Assurance Manager
 - Responsible for managing all aspects of the improvement effort
 - Reported status and results to the Executive Sponsor
- Rolf Reitzig
 - cognence, inc. Principal Consultant
 - Helped StorageTek design and implement a strategy that would work most effectively in their situation and environment

The Company and Organization

- StorageTek is a \$2B company based in Louisville, CO that designs, manufactures, sells and maintains data storage hardware and software
- The Software Engineering (SE) division develops and sells sophisticated software-based systems that customers use to store and retrieve information electronically
- SE has locations in the U.S., Australia, France, and the U.K., and utilizes off-shore partners in India
- Improvement effort began in mid-2002, and is continuing on today

2: Business Rationale For Improvement

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Business Drivers – Project-level Issues

- Poor project execution results in some cancelled projects
- Inconsistency in software development processes, documentation, and data collection results in additional complexity and training, with similar mistakes being repeatedly made; success generally depends on individual heroics
- The current operating environment is negatively affecting employee satisfaction
- Too many customer reports, too much “Firefighting” and “Just Do It”, leading to a focus on day-to-day issues
- Poor project management and use of control gates leading to project team members being told when work is due
- Adversarial project/marketing relationship

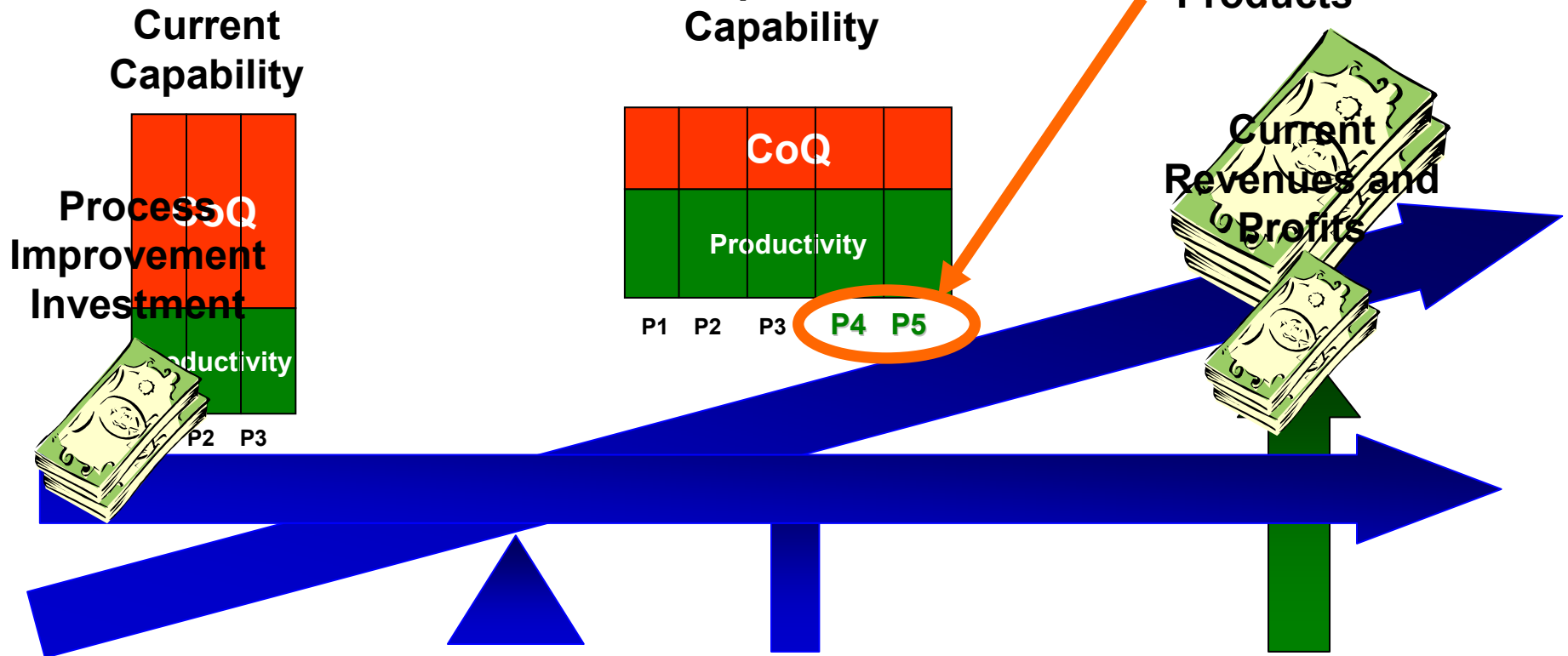
Business Drivers - New Development Efforts

- Historically, new storage product lines are introduced every 5-10 years, 2 new product development efforts were getting started
- With this cycle beginning for SE, leadership wanted to create a software engineering platform that would successfully deliver several new cutting-edge products
- This platform would be built on:
 - Processes – Rational Unified Process, Agile Methods
 - Tools – Rational suite of integrated tools
 - People – Processes and tools would be installed and institutionalized into the organization via the CMM/CMMI
- **Going forward, all new development projects are expected to utilize this platform to leverage organizational knowledge and allow for personnel portability**

Leverage

Process improvement has a leverage effect beyond just quality and productivity increases

Higher Revenue and Profits through More Marketable Products



Improvement Effort Must Tie to Corporate Objectives

- StorageTek corporate objectives are to continuously focus on Quality, Cost, and Delivery (QCDs)
- Thus, the improvement effort's goals were mapped to the Corporations QCDs via a Process Improvement Plan
 - Improve the organization's slip ratio (delivery)
 - Reduce the number and severity of defects reported by external customers (quality)
 - Reduce the organization's Cost of External Rework (cost)
 - Ensure business cases are updated for projects that encounter schedule slippage
- Since process improvement efforts have lagging benefits, measurable improvements were not expected until 2004
- In the interim, a goal of achieving CMM Maturity Level 2 was established to provide a measurable milestone for SE

3: Pre-Existing Obstacles

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This Had Been Tried Before!

- Like most companies, SE had been through a series of unsuccessful process improvement efforts before
- In addition, the organization was “stove-piped”, with little interaction/communication among the various projects
- In the 6 months from June 2002 to December 2002, little progress was made due to organizational resistance

Organizational Culture Created its Own Obstacles

- Lots of “Fire-Fighting”
- Must put the “Bell on the Cat” to stop the “Bat Phone”
- Tendency to create heavyweight processes
- Need experience to change the culture
- No in-depth CMM/CMMI knowledge
- Inexperience with the Rational Unified Process

4: Approach

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Organizational Transformation Approach is Key

- Ultimately, the objective is to change the organization's culture to one of engineering excellence
- To do this, you must **change people's behaviors, including executive management's**
- To achieve results, StorageTek engaged cognence, inc. to assist by:
 - Implementing organizational transformation techniques
 - Tying the improvement effort to business needs
 - Bringing in Rational Unified Process and CMM/CMMI experience
- Some positive aspects in SE:
 - Executive sponsorship for the effort
 - Within projects, a strong Esprit de Corps
 - Effective use of Agile methods in several projects that facilitated elements of controlled, effective, project execution

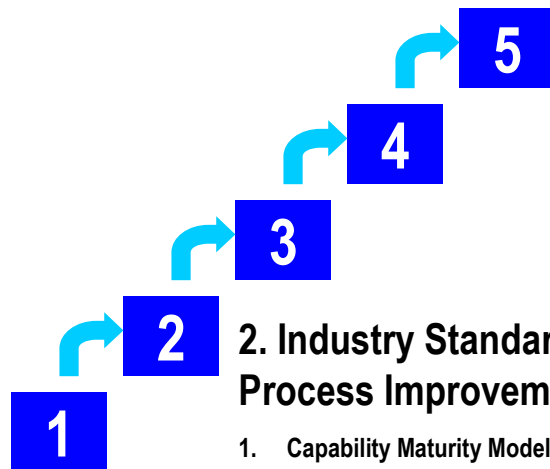
Organizational Change Approach

cognence, inc. APEX approach integrates 3 powerful drivers towards SW competitive advantage



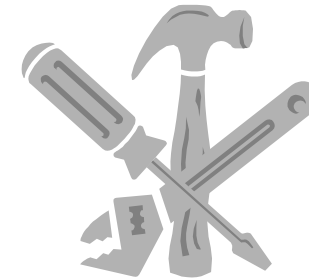
1. Organizational Transformation Best Practices

1. Urgency
2. Guiding coalition
3. Vision & strategy
4. Communication
5. Employee Empowerment
6. Short-term Wins
7. More change
8. Permanent culture change



2. Industry Standard Software Process Improvement (SPI) Models

1. Capability Maturity Models (CMM, CMMI)



3. Leading Automation Tools, Software Engineering Best Practices, Standards

Rational. software

Organizational Change Techniques as a Framework

- While there seemed to be executive urgency for the effort, it had not yet driven down effectively into the organization
- To get things started and to overcome resistance to change, techniques based on John Kotter's *Leading Change* were employed¹
- In late 2002, the “movers and shakers” in SE were gathered for 2 months of intensive team building, training, and planning sessions
- While difficult at first, the outcome was an agreed-to vision, strategy, and change infrastructure that would be supported by numerous key members of the organization
- This strategy spelled out additional necessary change elements such as communication, empowerment, short-term wins, and the iterative approach needed to be successful

1: John P. Kotter (1996) *Leading Change*, Boston, MA.: Harvard Business School Press

It Was Important to Leverage Industry Standards

- The Rational Unified Process substantially satisfies most of the CMM's Maturity Level 2 Key Process Areas (KPAs)
 - Requirements Management
 - Project Planning
 - Project Tracking and Oversight
 - Configuration Management
 - Measurement and Analysis (CMMI)
- Leveraging RUP gave SE a head-start in the process definition phases of the improvement effort; more time could be spent tailoring RUP's processes and templates to meet the organization's needs

Use of Agile Methods Enhanced Results

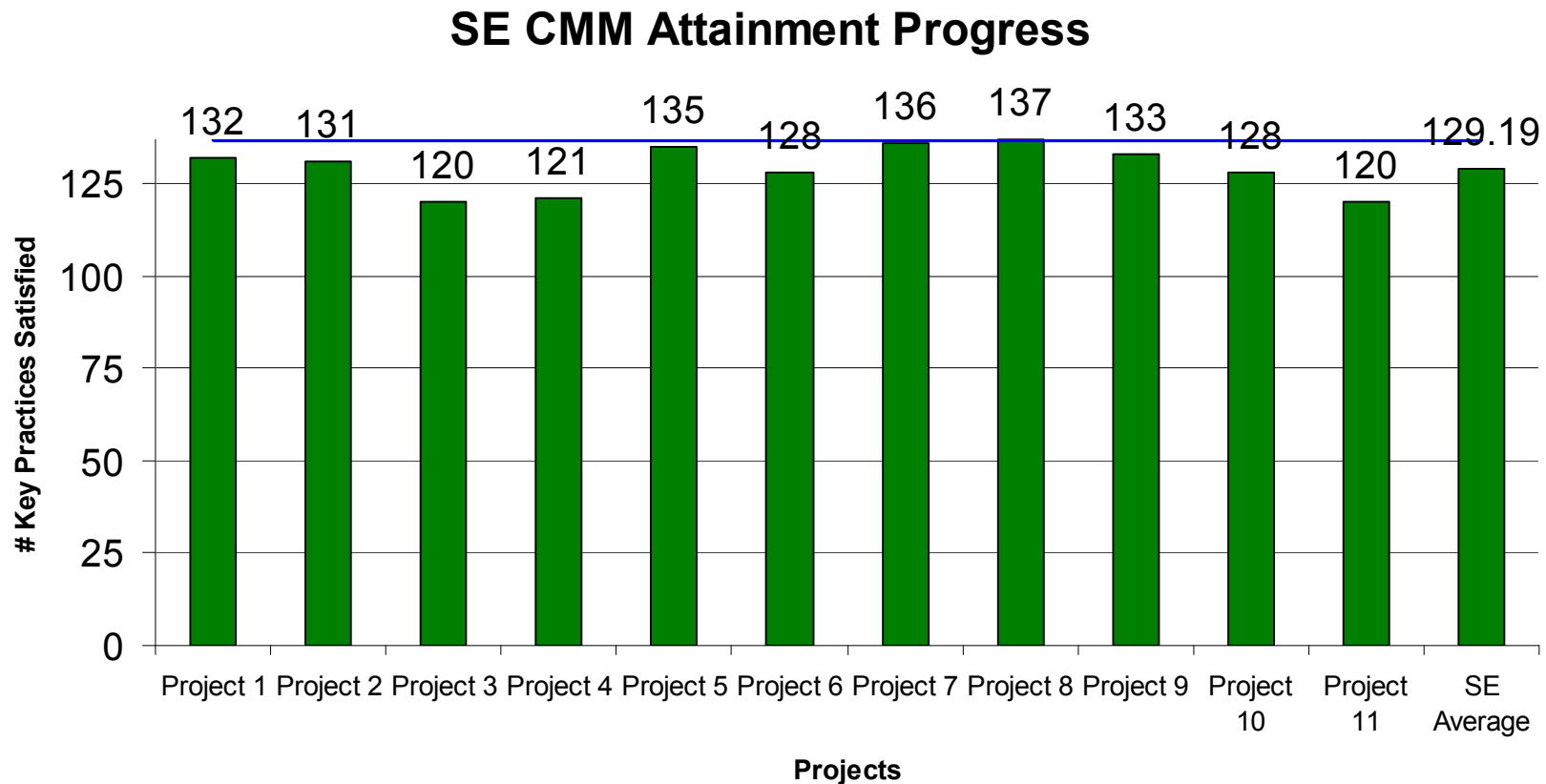
- “Lean and Mean”
- User stories/use cases represent requirements
- Iterative approach, small releases
- Daily stand-up meetings
- Unit tests are written first
- Nightly integration and testing
- Use of project velocity to monitor progress and plan subsequent iterations
- Combining RUP, Agile, and CMMI methods works!

5: Benefits

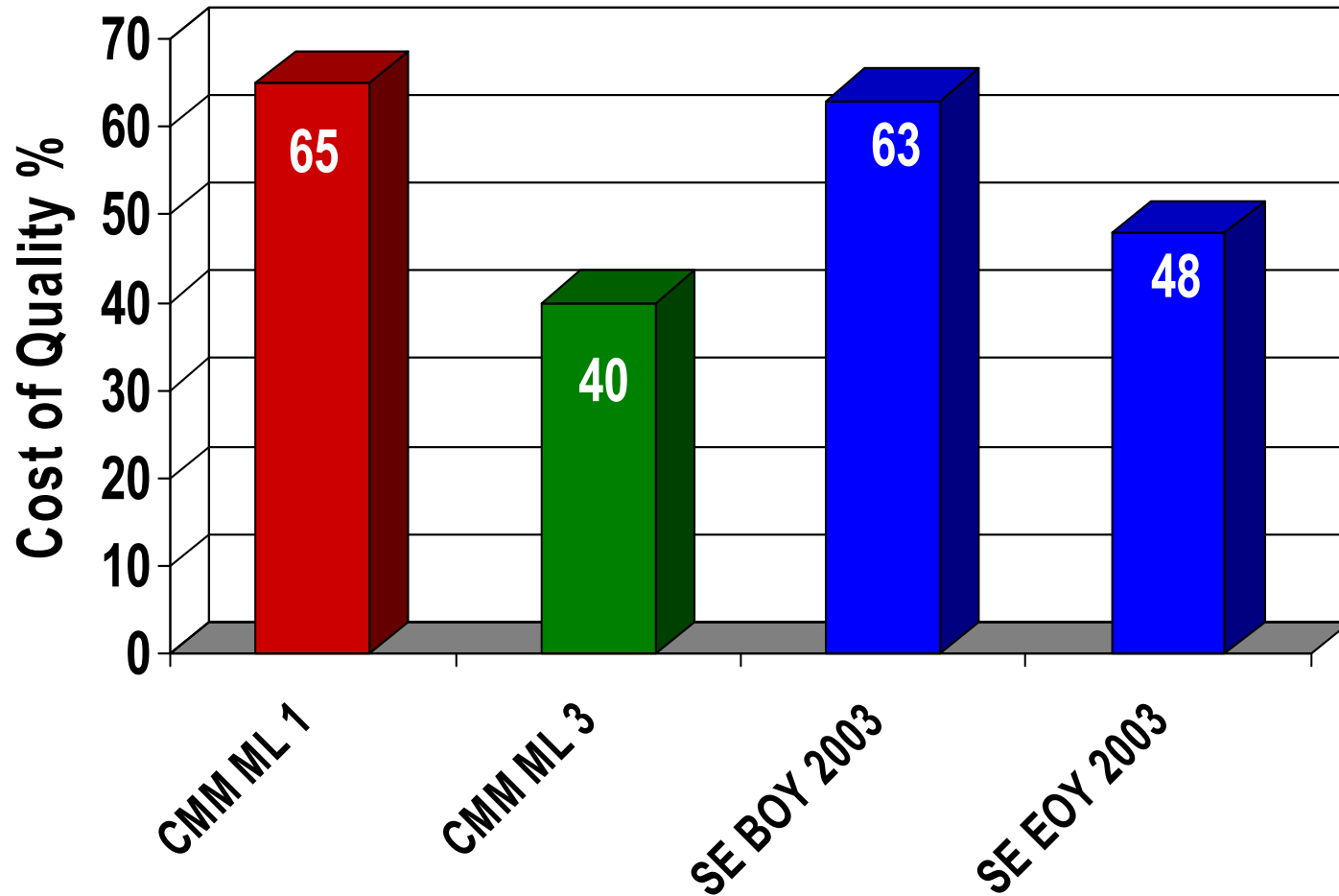
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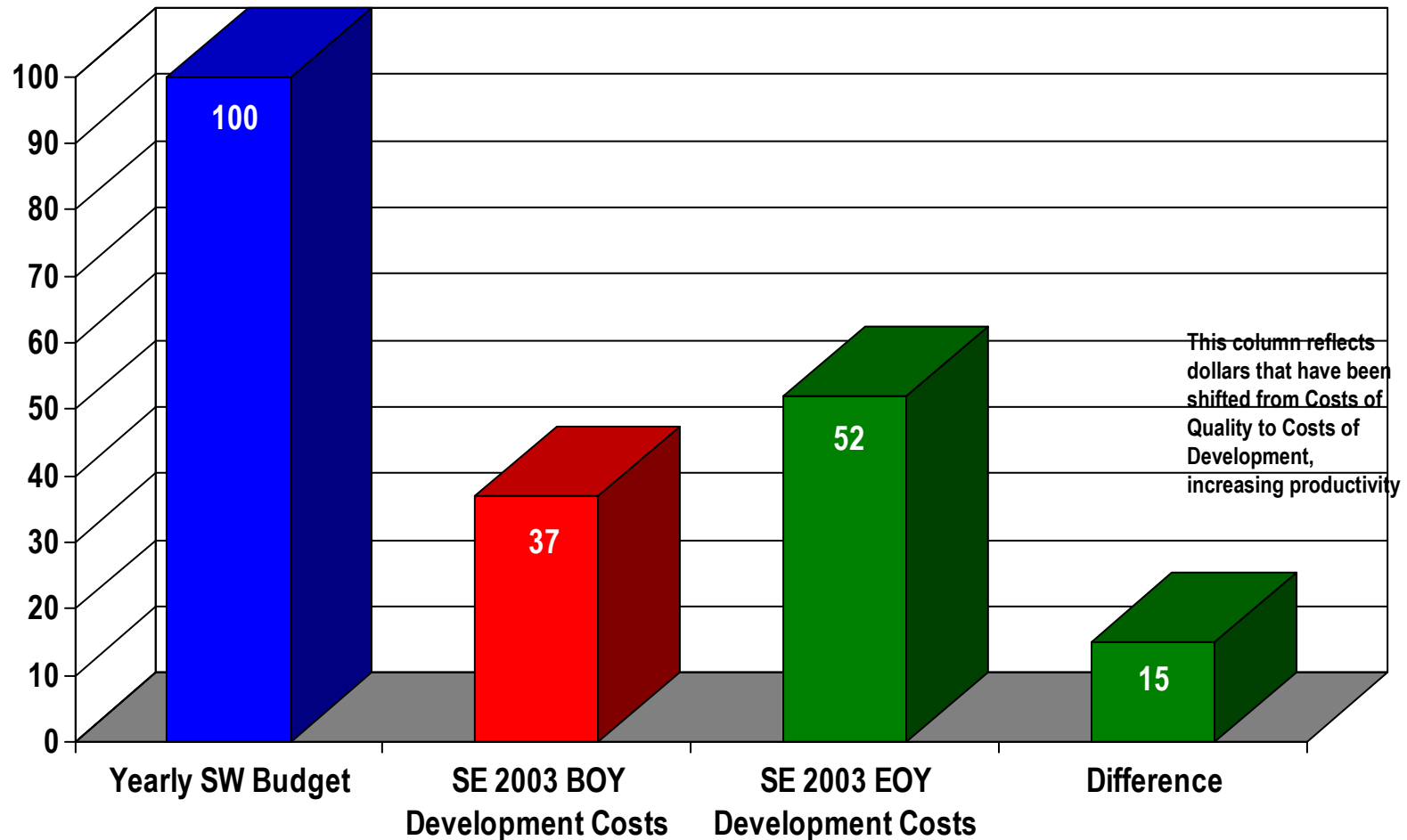
95% Compliance with CMM Maturity Level 2



Dramatic and Measurable Productivity Increases



Significant SE 2003 Process Improvement Impact



All figures are for software efforts only. HW, SW, and tool expenditures are not included

Improved Schedule Adherence

- Million line-of-code (LOC) product (inclusive of test harnesses) developed in 24 month time frame, significantly beating COCOMO-predicted schedule and budget estimates
- Several projects consistently meeting schedule commitments
- Projects which previously had schedule slippage measured in months now experiencing slippage measured in days or weeks
- Requirements management helping control the “Bat Phone”
 - Executive management and projects know what to do when requirements are changed
 - With improved requirements management, changes that would previously be “shoe-horned in” are recognized as too disruptive to the current plan, and are deferred or cancelled

Moving Towards a Software Factory

- RUP high-level phase/iteration approach institutionalized, creating a common way for projects to communicate status
- Rational toolset effectively working on 2 major projects
- Senior management project reviews instituted in January 2003 dramatically decreasing the amount of firefighting occurring
- Software quality assurance helping to mentor projects on CMM/CMMI best practices and how to implement them
- SQA also driving urgency through monthly “QuickLooks” that allow projects to demonstrate progress toward CMM/CMMI compliance
- Organizational communication and collaboration greatly increased – much less “stovepipe” effect

6: Wrap Up

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Summary

- StorageTek's objective was to develop a "franchised" software engineering platform based on RUP, Rational's tools, Agile methods, and the CMM/CMMI
- This platform was expected to deliver quality software on-time and on-budget, meeting business objectives
- Using the CMM/CMMI as a guideline, standard Maturity Level 2 processes based on RUP were installed across the organization
- Automation of processes using Rational's tools help to drive quality and productivity
- These processes had a dramatic impact on projects' performance, and the organization overall
- Now that the platform is in place, SE is moving to continuously improve it and further enhance and institutionalize the processes and tool set

Questions?

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Thank You!

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