The Testing Improvement Story: Turning Defects into Dollars

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You must demonstrate the value of your quality efforts to Management

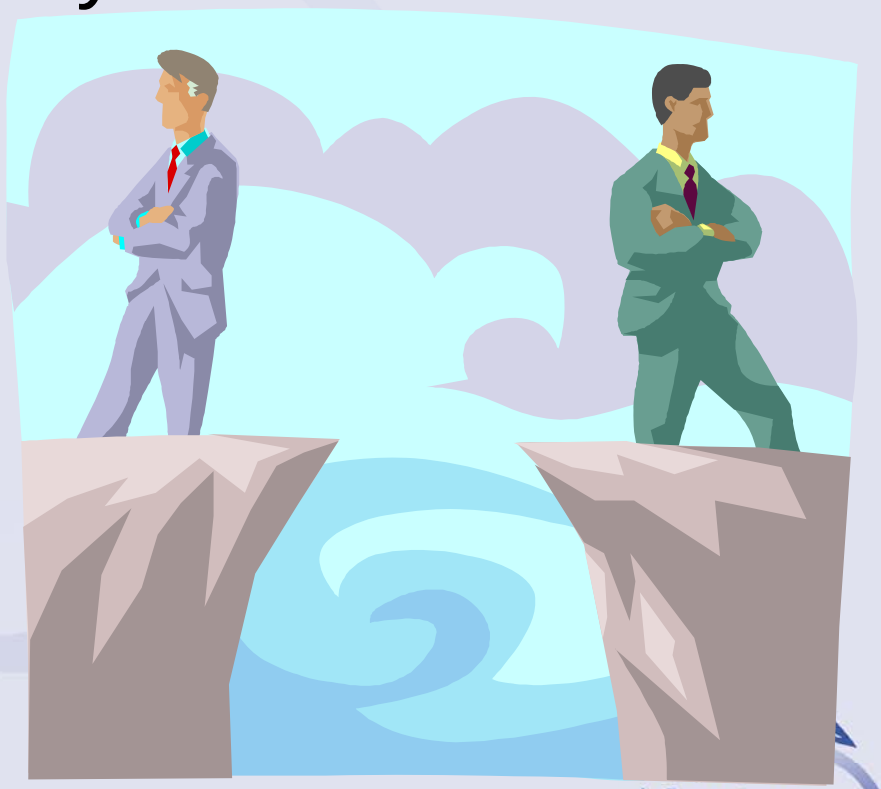
- Demonstrate ROI for every effort
- Track impact of every effort
- Use objective and subjective measures
- Speak the language of management:
  - Savings
  - Cost Avoidance
  - Revenue/Time to Market
  - Return on Investment

The Beta Company Case Study Situational Analysis -- 2006

- Beta is a big player in its industry
- Been around a long time, bureaucratic, slow to change – stuffy
- New, vigorous competition, markets shifting and changing
- Many long-term employees who are dedicated to improvement & quality
- Weak IT organization, diffuse reporting structure at beginning of study

Gap Analysis
DIY or Consultant

- QA and Testing Survey
- Measurement Readiness Survey
- Interviews
- Document Review
- Defect Analysis
- Observation



Use Surveys to Demonstrate Need and Results of Efforts

- Keep it simple, short, and focused
- Use a consistent format: positive statement, 5 choices (1 = Strongly Disagree; 5 = Strongly Agree)
- Ask for specific comments – adds depth
- Supplement with interviews, doc review
- Be as concerned with range of responses as calculating the average

Report Content

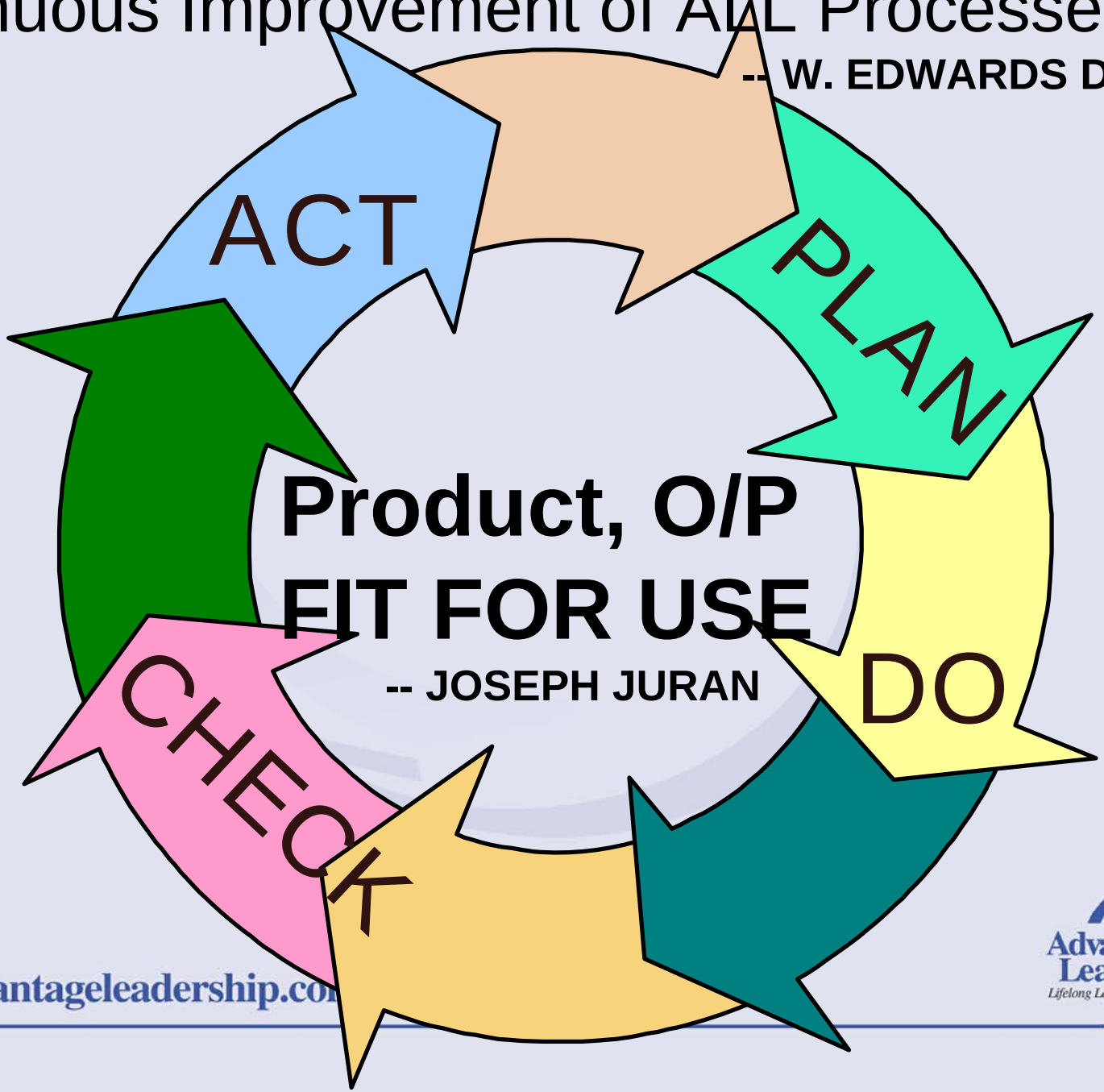
Context for report and recommendations =

- Cost of Quality Model
- Definitions of Quality, Quality Assurance, Quality Control, Quality Improvement
- International standards: CMM(I), TMM
- Strategic approach to improving results of testing and development

Continuous Improvement of ALL Processes

-- W. EDWARDS DEMING

QUALITY IS…



Advantage Leadership
Lifelong Learning for Leadership

Relationship among all quality elements

ISO Six Sigma/Lean
MBNQA IEEE
CMM(I) TMM
TickIT SPICE
PMI ITIL Other

QI = REDUCE DEFECTS

Quality Improvement QI

- **Improve product**
- **Improve process**
- **Reduce variation**
- **Reduce defects**
- **Re-engineer process**

ACT

QA = PREVENT DEFECTS

Quality Assurance QA

PLAN

- Define SDLC Processes
  - **Development**
  - **Maintenance**
  - **Purchase**
  - **Outsource**
- Define Standards
- Define Review Processes
- Define Measurement
  - **Analyze data**
- Define Test Processes, Tools
- Define:
  - **QA, QC, QI, IT processes**
- Train

DO

QC = FIND DEFECTS

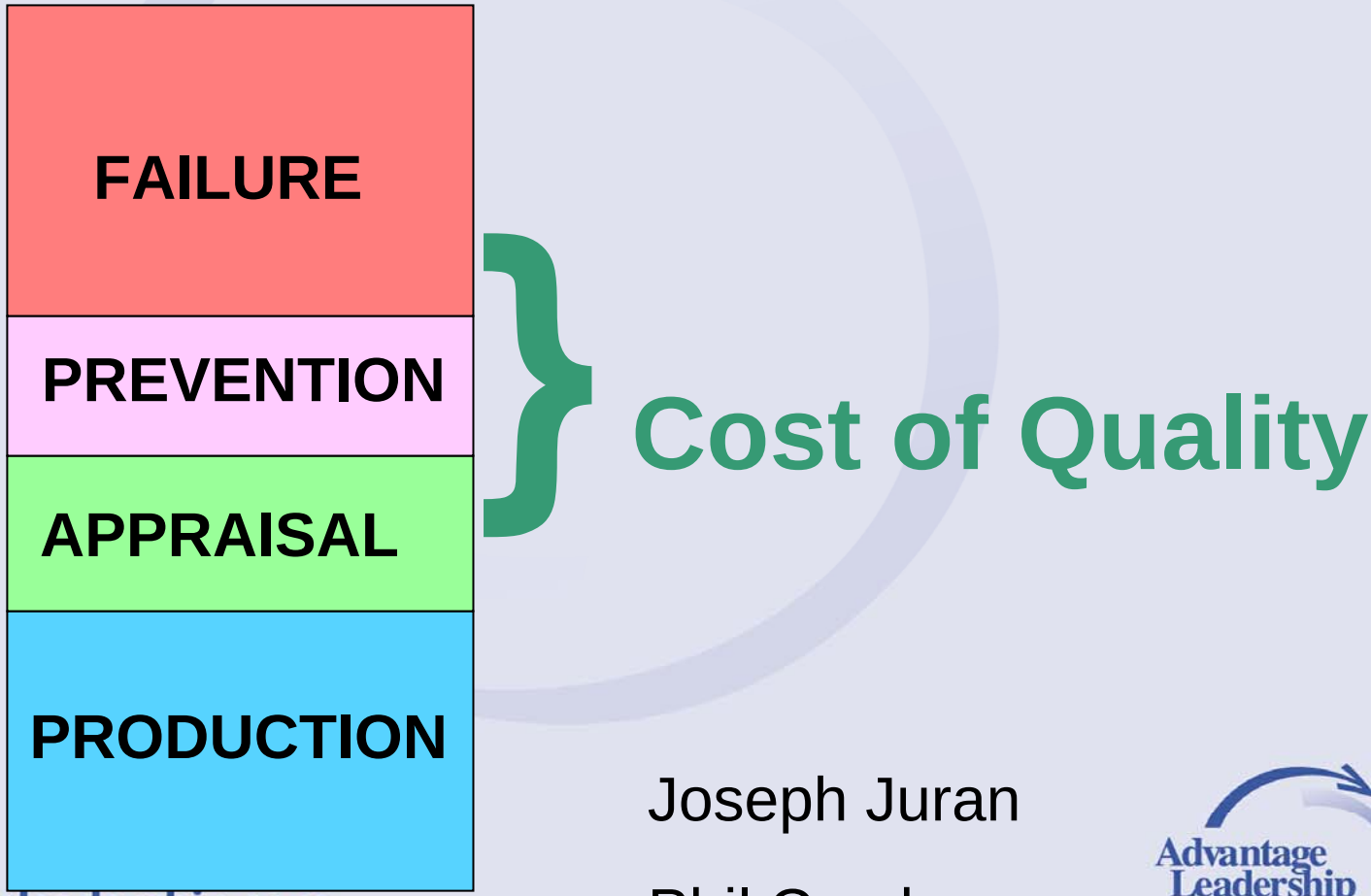
Quality Control QC

- Reviews:
  - Walkthroughs,
  - Peer Reviews,
  - Inspections
- Audits: product, process
- Testing: All types, UAT
- Controls: Change, Configuration

CHECK

Defect DATA
Lessons Learned

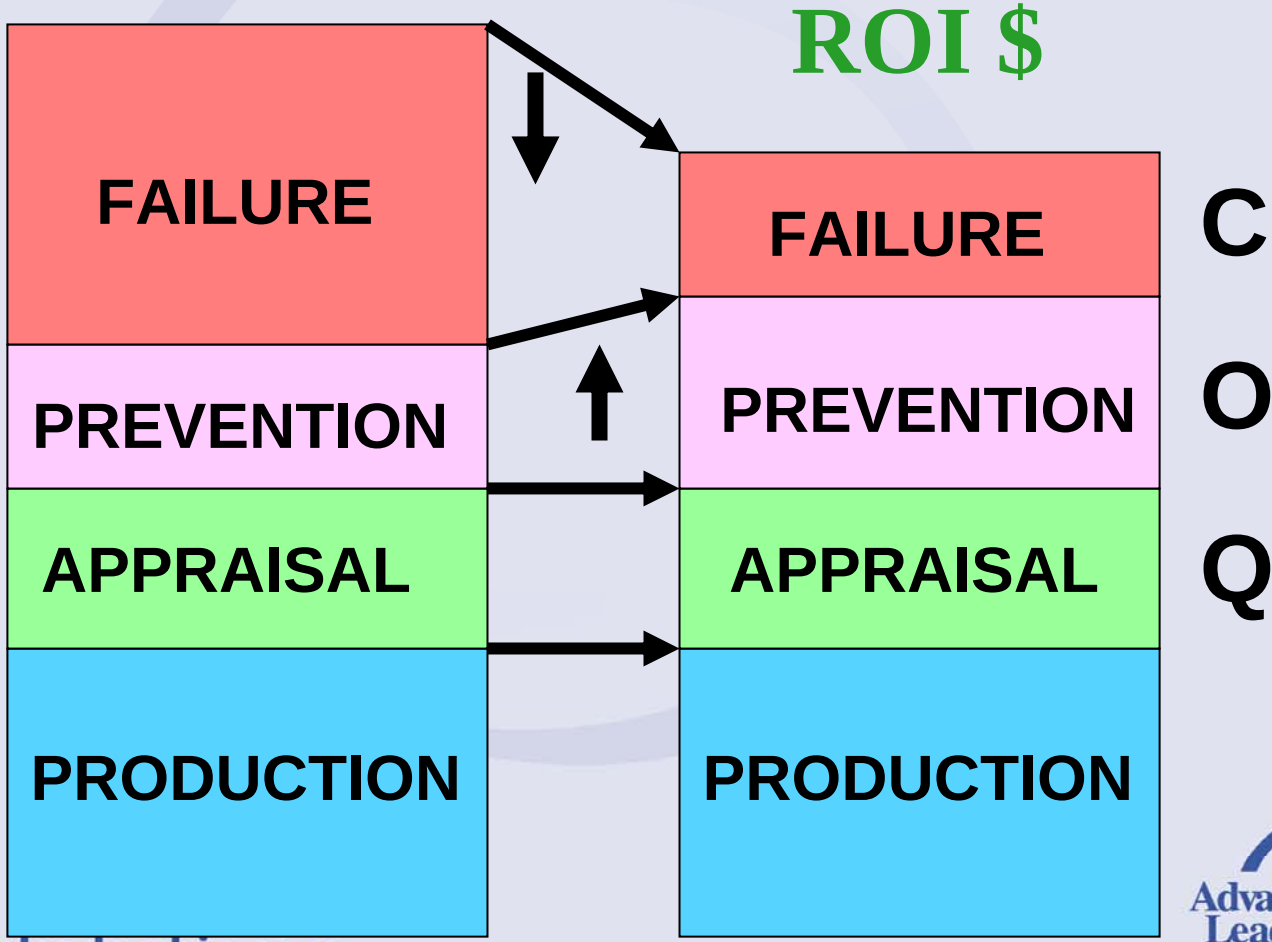
Cost of Quality
The Good, the Bad and the Ugly



Joseph Juran

Phil Crosby

Cost of Quality
The Good, the Bad and the Ugly



Strategies to Reduce COQ

- Increase the Cost of Prevention
- Shift Appraisal emphasis to beginning of Life Cycle, more static testing
- Use test tools more effectively, efficiently

Why should BETA do this?

- Appraisal: Find defects early, save time, $
- Prevention: Reduce defects, reduce costs;
- Use defect data to improve processes
- Improve time to market

BETA had Quality Policy but ignored it

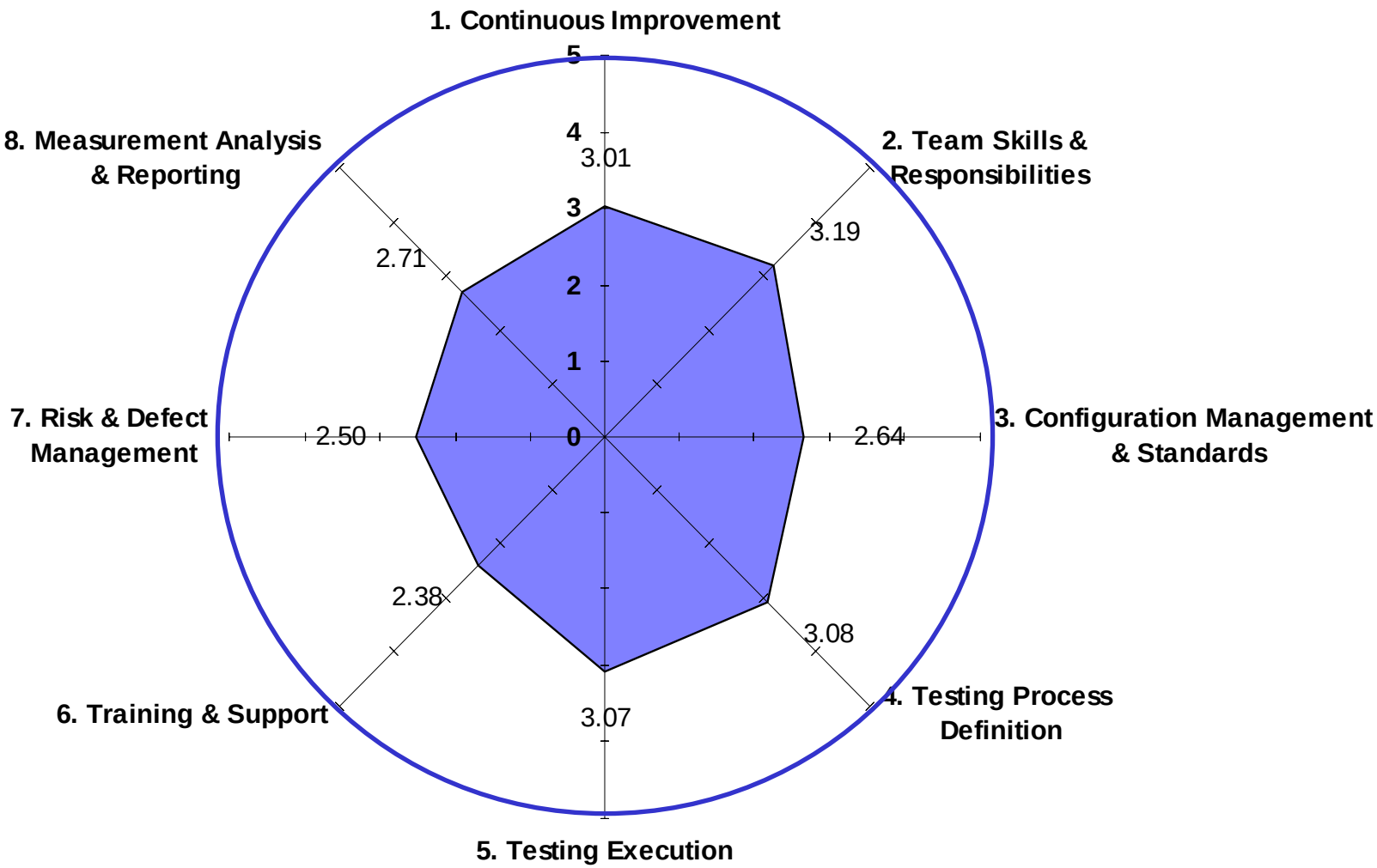
QT used existing policy as starting point

Surveyed all IT employees, managers

Questions based on TMM, CMM, specific conditions at BETA

Kiviat Diagram shows results dramatically

Testing & QA



50.4% Response Rate

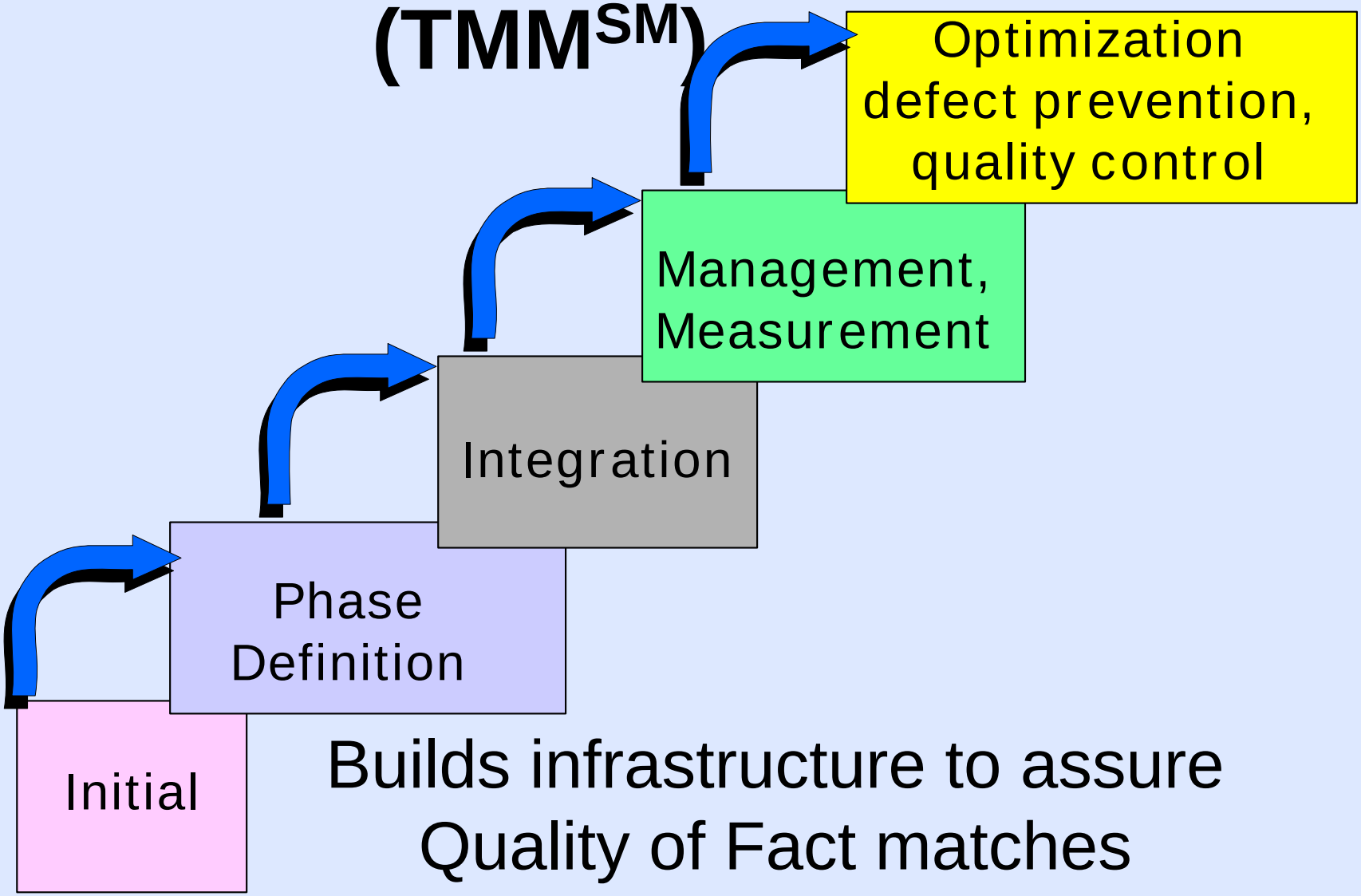
QA & Testing Survey: Quality Process Conclusions

- Islands of Good SW Engineering Practice
  - "We have pockets of order"
- "'It's too late…ship it' is the rule"
- "We need a quality group that can't be circumvented"
- Lack of fully deployed Quality Policy
- Variable processes are defect generators

Conclusions compared BETA practices to CMM KPAs to demonstrate maturity level

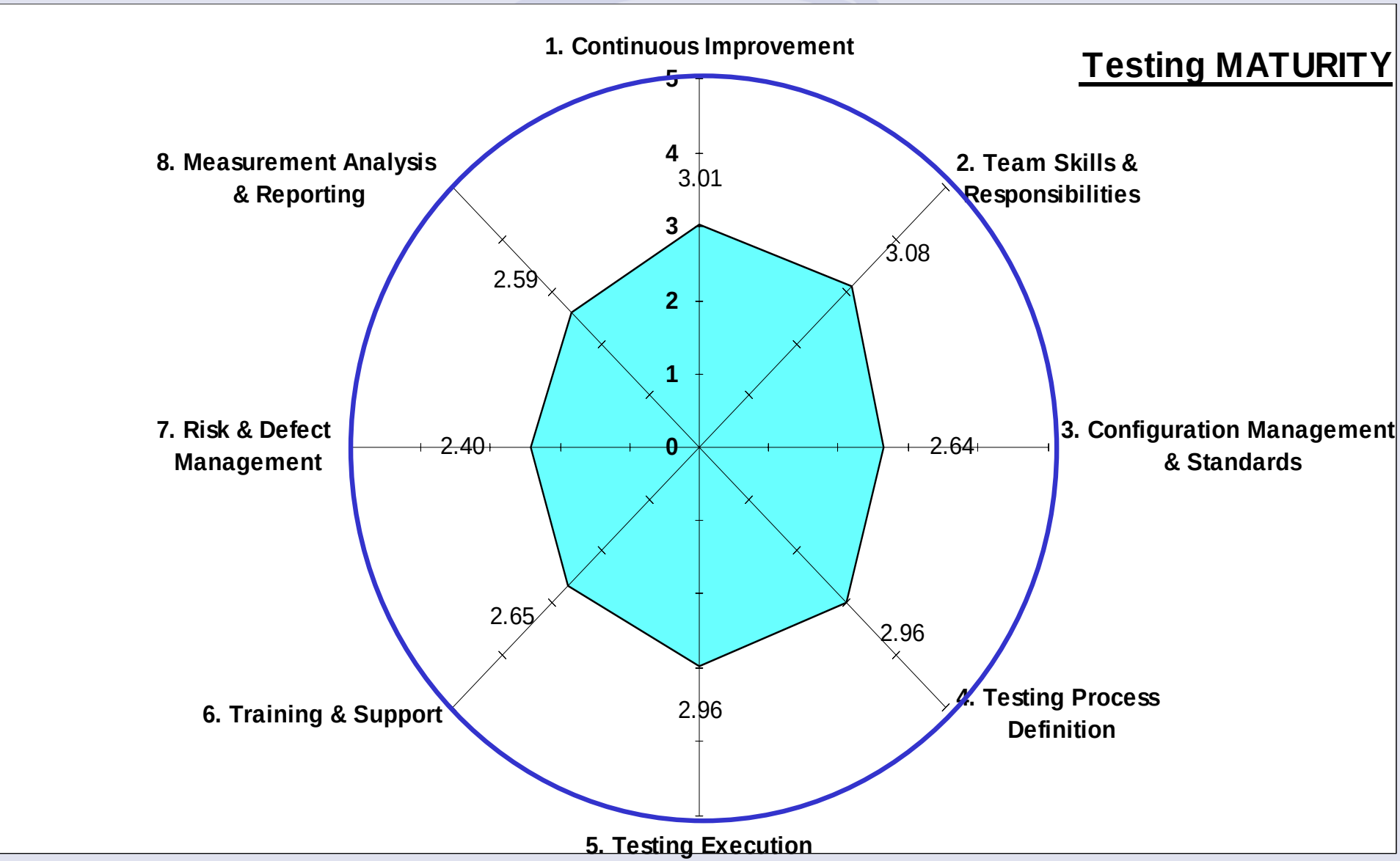
- BETA believed it was CMM Level 2 – it was Level 1
- Highlighted good practices, teams
- Place conclusions in relation to GSEP – Good Software Engineering Practice
- Made recommendations specific for company

Testing Maturity Model (TMM^{SM})



Builds infrastructure to assure
Quality of Fact matches
Quality of Perception

Testing Maturity



Conclusions compared BETA practices to TMM Goals to demonstrate maturity level

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Testing Center of Excellence (recommendations)

- Define, deploy testing methodology
- Train testers on tool use
- Matrix manage all testers
- Manage technical testers
- Audit use of testing methodology
- Select, train new testers
- Consult to projects on testing, UAT

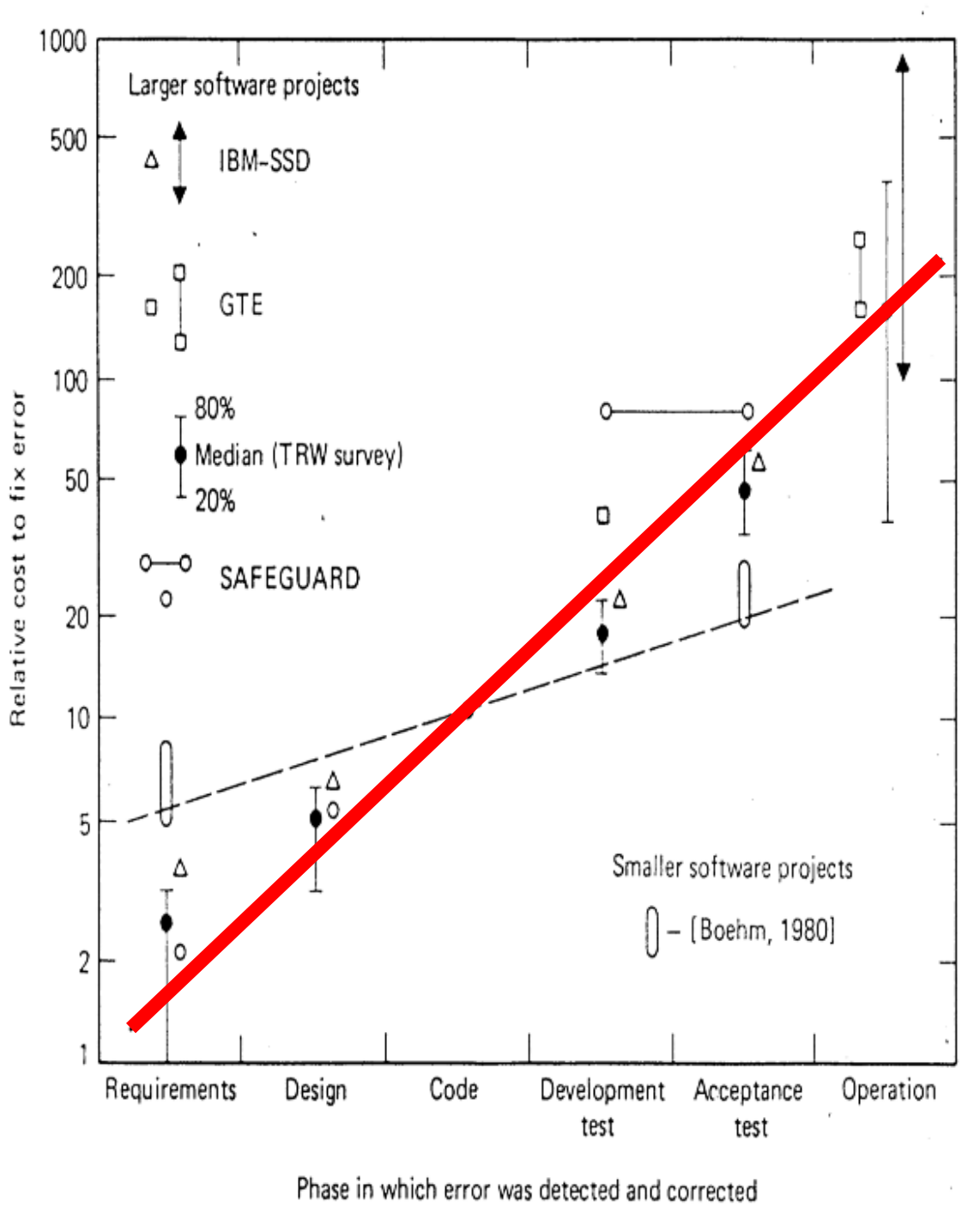
Implementation Considerations

- Establishing Mission Critical Processes for Testing
- Cost/Benefit Analysis: 10:1 ROI – *could* avoid $5 million first year of implementation
- Funded through defect elimination and prevention

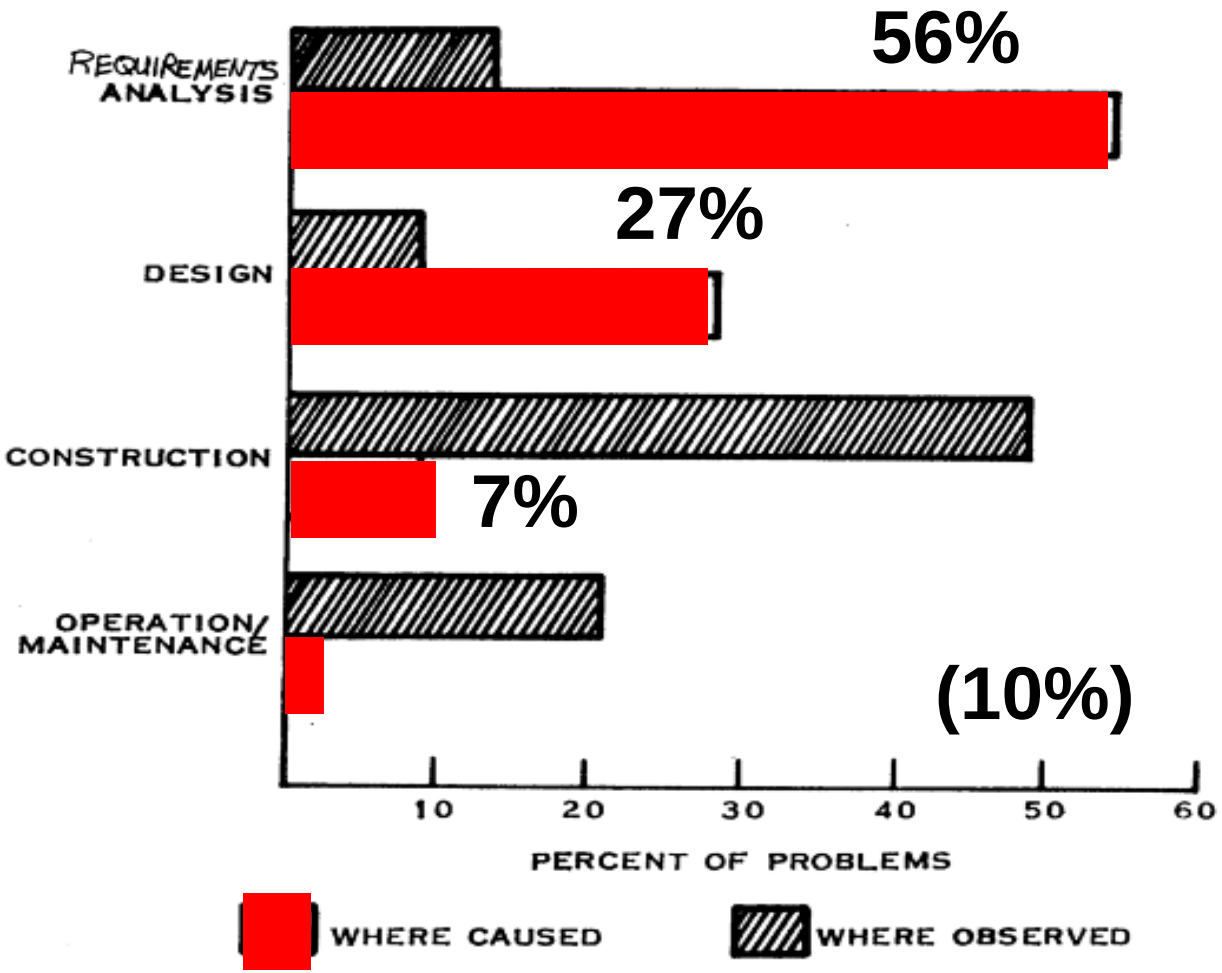
The Defect Study

- Analyze defect data for one year from test tool defect tracker
- All defects reported and closed prior to production and in production cycle
- Analyze defect data by phase found; ignore ‘cause’ data
- Analyze data using industry studies

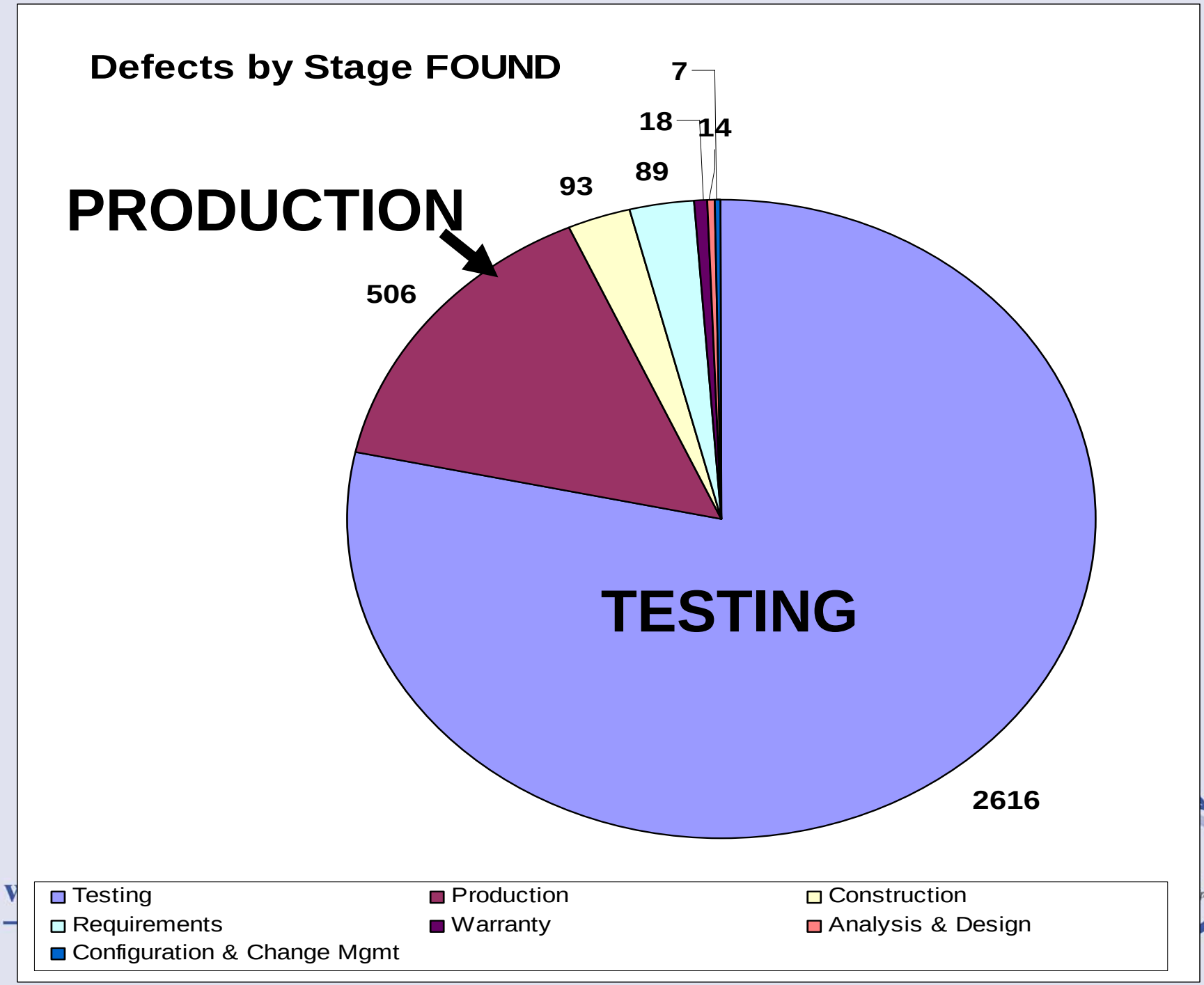
Software Engineering Economics
Barry Boehm
Prentice Hall, 1981



Where Defects Caused/Found



James Martin


Defects by Stage FOUND
PRODUCTION
7
18
14
89
93
506
TESTING
2616
Testing
Production
Construction
Requirements
Warranty
Analysis & Design
Configuration & Change Mgmt

Calculating Defect Cost

Life Cycle Stage	Relative Cost/Defect	Example: Actual Cost/Defect
Requirements	$2	$100
Design	$5	$250
Code	$10	$500
Testing	$20	$1000
Configuration Mgt	$50	$2500
Warranty	$100	$5000
Production	$200	$10,000

Cost to Repair = (Defects) X (Relative Cost) X (Hourly Rate) X (Time)
(Based on Boehm)

Example: $50/hour

What defects cost BETA in 2007

Life Cycle Phase	Number of Defects Found	Percent of Defects Found	Cost to Find/Fix Defects
Requirements	46	1%	$ 4,600
Design	27	0.6%	$ 6,750
Code/Unit Test	89	2%	$ 44,500
Test	3954	86%	$ 3,954,000
Configuration	14	0.3%	$ 35,000
Warranty	37	0.8%	$ 185,000
Production	437	9.5%	$ 4,370,000
TOTAL	4604	100%	$ 8,599,850

Based on hourly rate of $50 – note actual rate for BETA was higher

BETA Costs to Find 85% of Defects Where They Are Caused in 2007

Life Cycle Stage	Actual Cost of Found Defects	% of Defects Found	Expected % of Defects	Expected Number of Defects	85% of Defects in Stage	Cost to find/fix 85% of Defects
Requirements	$ 4,600	1%	56%	2578	2191	$ 219,100
Design	$ 6,750	0.60%	27%	1243	1057	$ 264,000
Code/Unit Test	$ 44,500	2%	7%	322	274	$ 137,000
Test	$ 3,954,000	86%	10%	461	*931	$ 931,000
Configuration	$ 35,000	0.30%	0	0	0	---
Warranty	$ 185,000	0.80%	0	0	0	$ ---
Production	$ 4,370,000	9.50%	0	0	**151	$ 1,510,000
TOTAL	$8,599,850	100%	100%	4604	4604	$ 3,061,000

*Test estimated to find 86% of remaining 1082 defects

**Remaining defects = 3% of total

Defect Study Conclusions

Conclusions:

- The current estimated cost of defects for 100% of projects is $14,000,000 out of a budget of $30,000,000 annually.
- Defect costs will increase as X projects emphasized.
- Favorable cost comparison to competitors unmaintainable.
- Defect source identification wrong, doesn't point to root causes
- Impossible to fix flawed processes with incorrect information.
- QT is not charged with providing vital data to management,
- Management cannot make effective decisions on Quality.
- If ALL defects found in stage where they were created, cost to find and fix defects would be reduced to $1,400,000!

BETA established
IT Plan Quality Framework

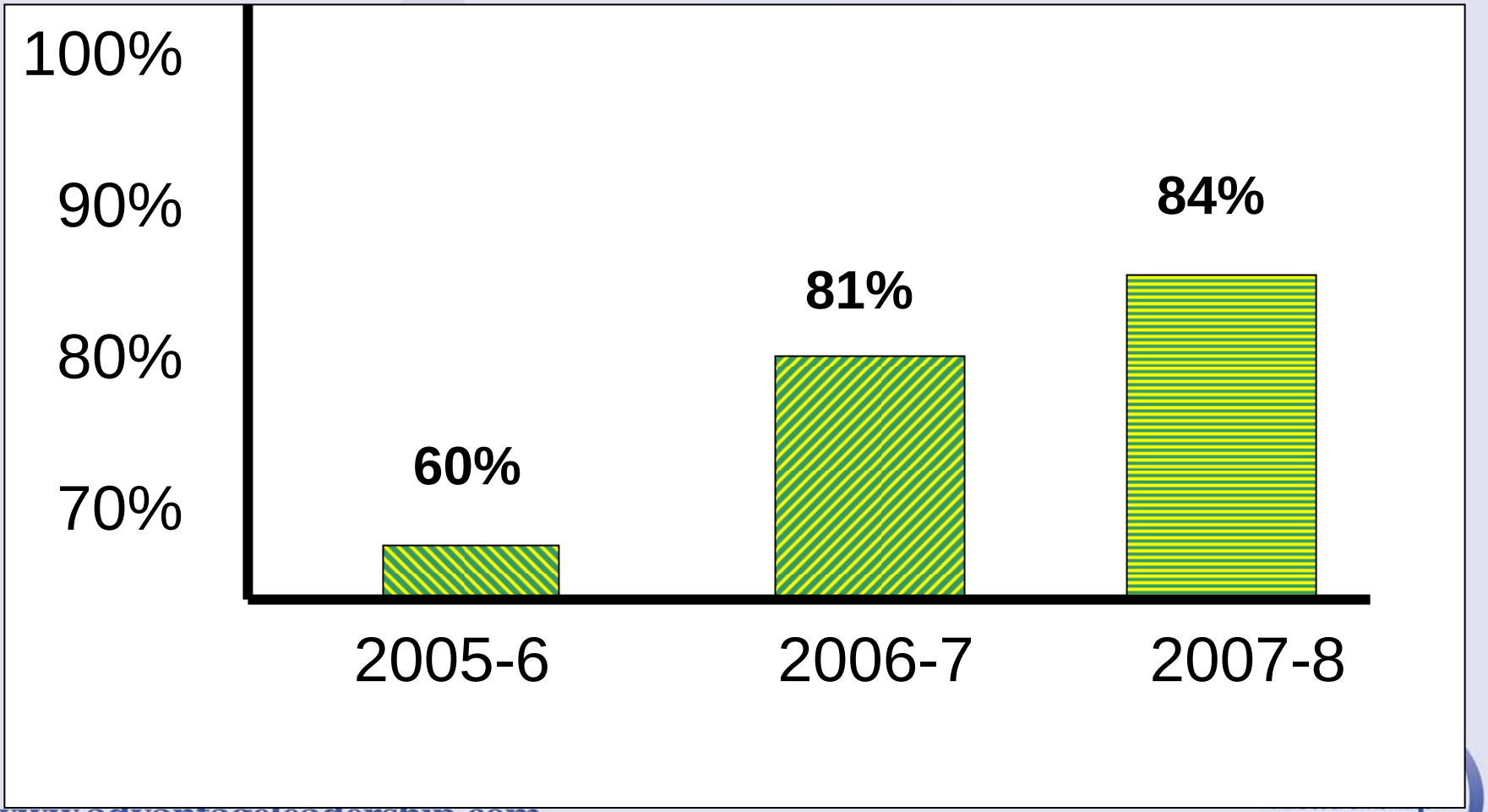
- Quality Management Definitions :
- Defined Principles
- IT Steering Committee; COO, VPs
- IT Policies: SDLC, Quality, Testing, Requirements
- Overall goal: reduce number of defects being introduced, identifying/resolving defects closer to their point of origin

Initiative to Improve Testing 2006 - 2008

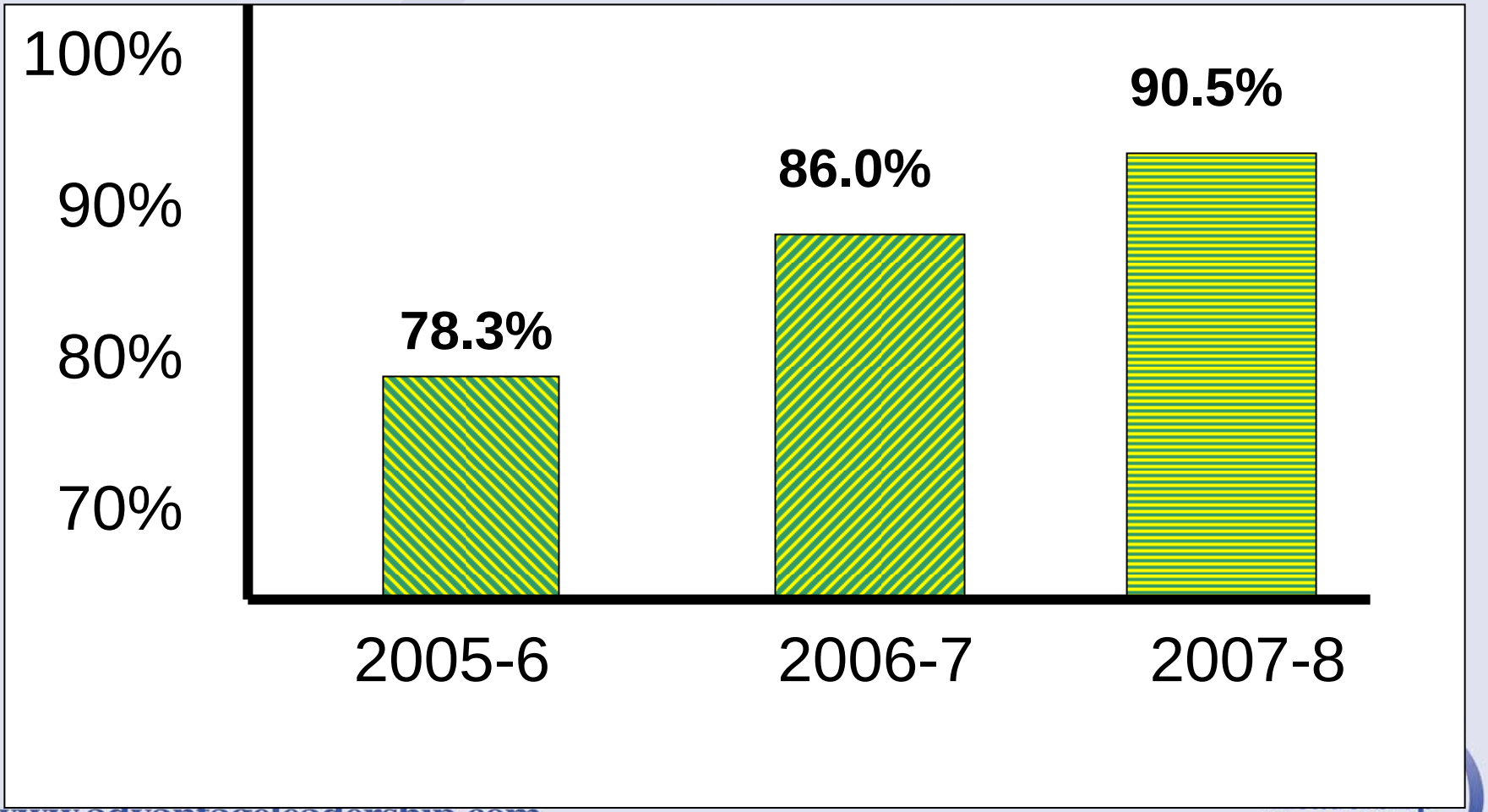
- **Testing Resource Center**
- **Automation and Performance Testing**
- **Stage Gate Assessments**
- **Business Acceptance Testing**
- **Testing and Quality Policy**
- **Use of XYZ Test Tools**
- **Definitions of Testing Roles, Responsibilities**
- **Improved Templates for Testing**
- **Early Involvement Project Control Boards**
- **IT Plan Deployment**

IT Quality Plan Framework embraced by management

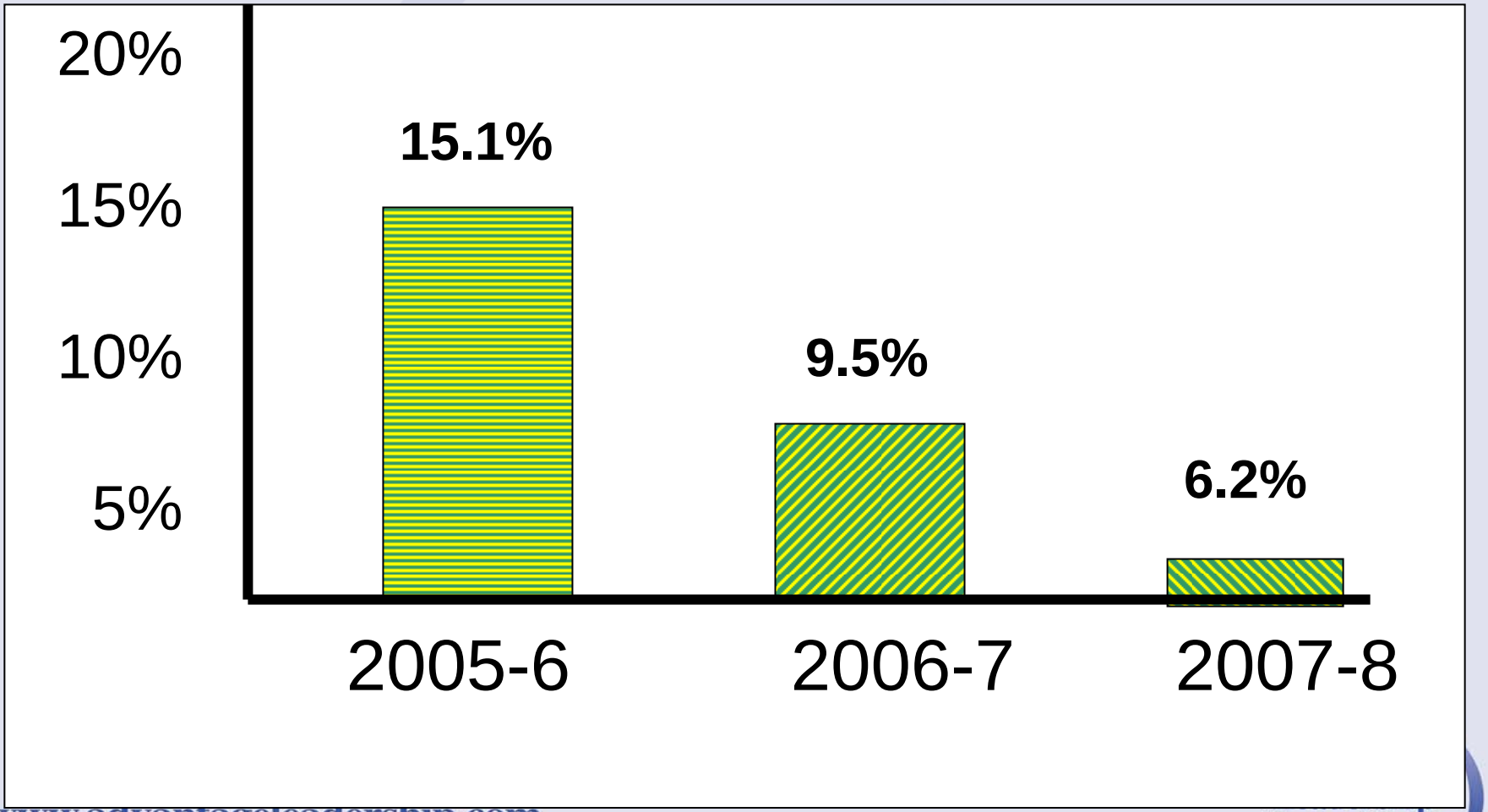
Increased use of ZYZ Test Tool to track Defects



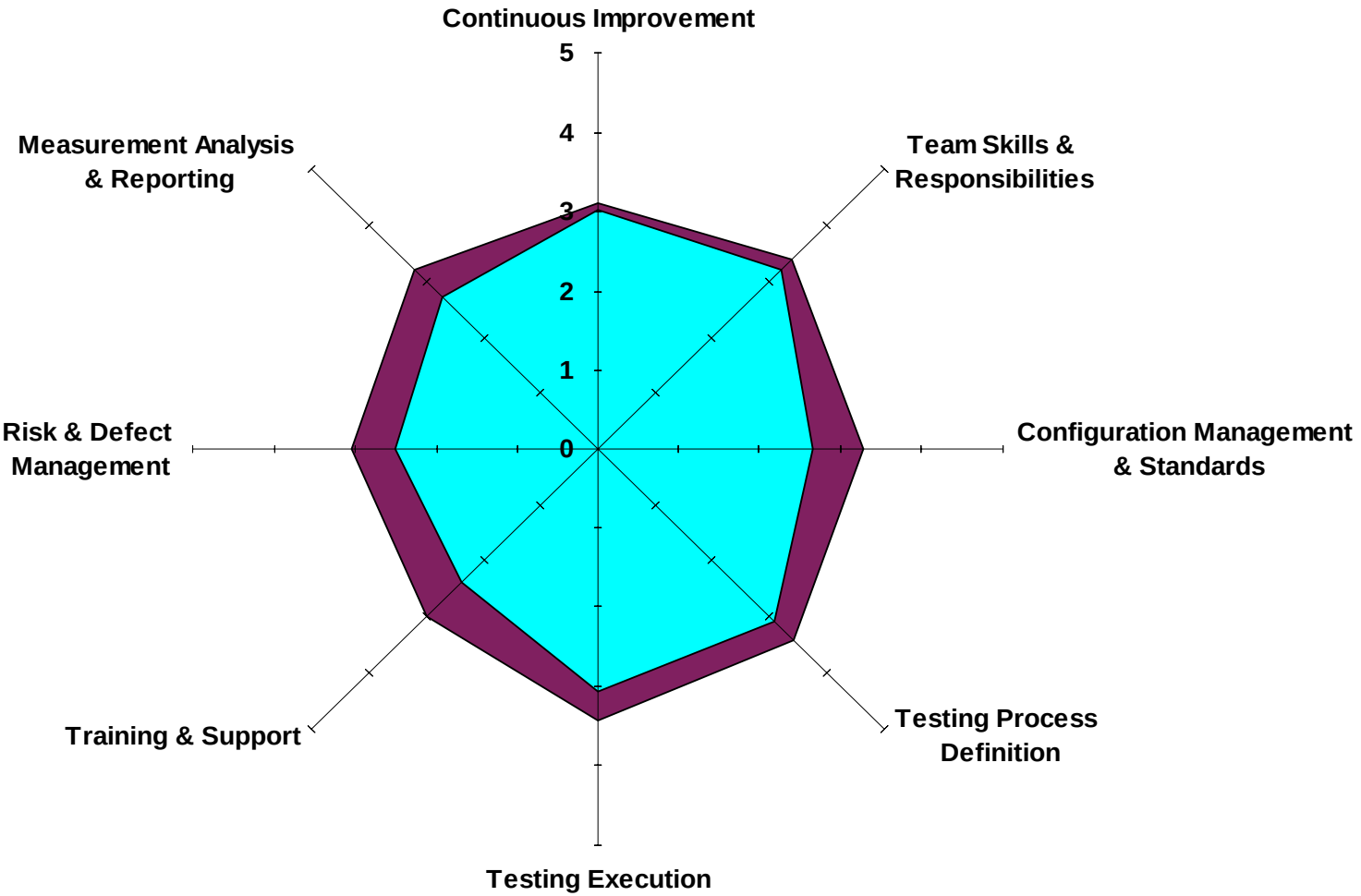
Improved defect detection from improved testing processes



Fewer defects enter production due to improve testing processes

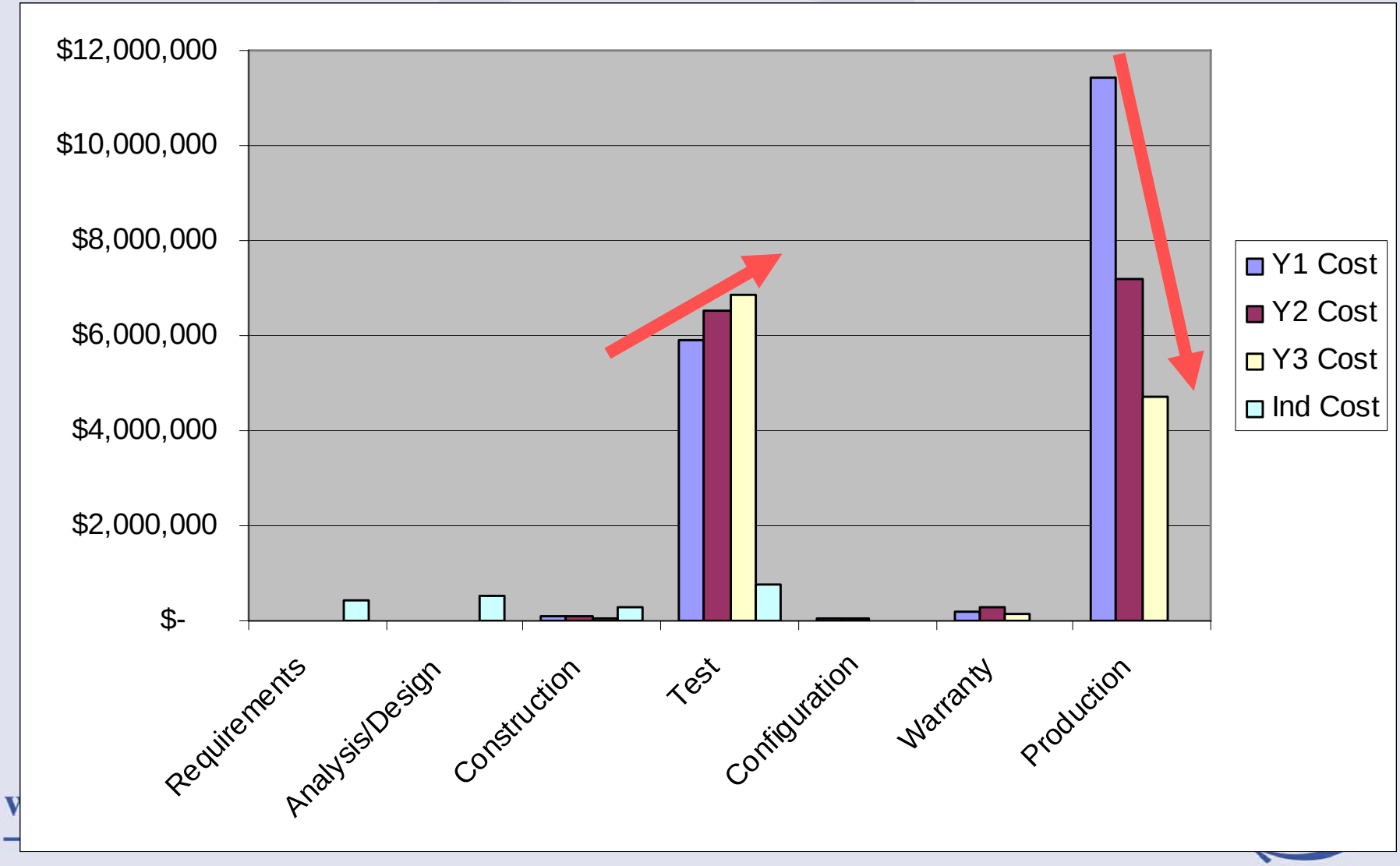


Baseline = Blue vs. Year 3 Change = Purple



80.5% Response Rate

Defect Costs Comparison



BETA began implementing Inspections in 2008

- Trained Inspectors and Moderators
- Established Defect Analysis and Reporting
- Compared similar projects with and without Inspections

Project A With Inspections vs. Project B Without Inspections

	# Defects		% of Defects		Cost of Defects	
Stage Found	**Project A**	**Project B**	**Project A**	**Project B**	**Project A**	**Project B**
REQ	**220**	**-0-**	**94.00%**	**-0-**	**$22,000**	**-0-**
DES	2	1	0.85%	1.00%	$500	$250
CODE	-0-	-0-	-0-	-0-	-0-	-0-
TEST	**12**	**83**	**5.13%**	**83%**	**$12,000**	**$83,000**
Config	-0-	-0-	-0-	-0-	-0-	-0-
Warranty	-0-	-0-	-0-	-0-	-0-	-0-
PROD	**-0-**	**16**	**-0-**	**16%**	**-0-**	**$160,000**
Inspection/ Train Cost					$11,346	
TOTAL	**234**	**100**			**$45,846**	**$243,250**
Cost Avoid					**$518,404**	**-0-**

Other Results

- First 5 pilot Inspections resulted in $5 million in cost avoidance
- QT preserved after major reorganization; value recognized by new executives
- Inspections established as part of required methodology
- Continued defect studies and comparisons of projects with and without inspections published; dramatic results

What can you do?

- Conduct gap analysis with/without outside help
- Compare to CMM, TMM
- Extract defects from test tool defect tracker, analyze, demonstrate unnecessary costs
- Use GSEP - Good Software Engineering Practice
- Educate management, testers, PMs, others – show relevance
- Conduct follow-up analyses; show progress
- SHOW ROI
- BE A LEADER

Evolution of Profound Knowledge

Good Judgment
comes from
Experience

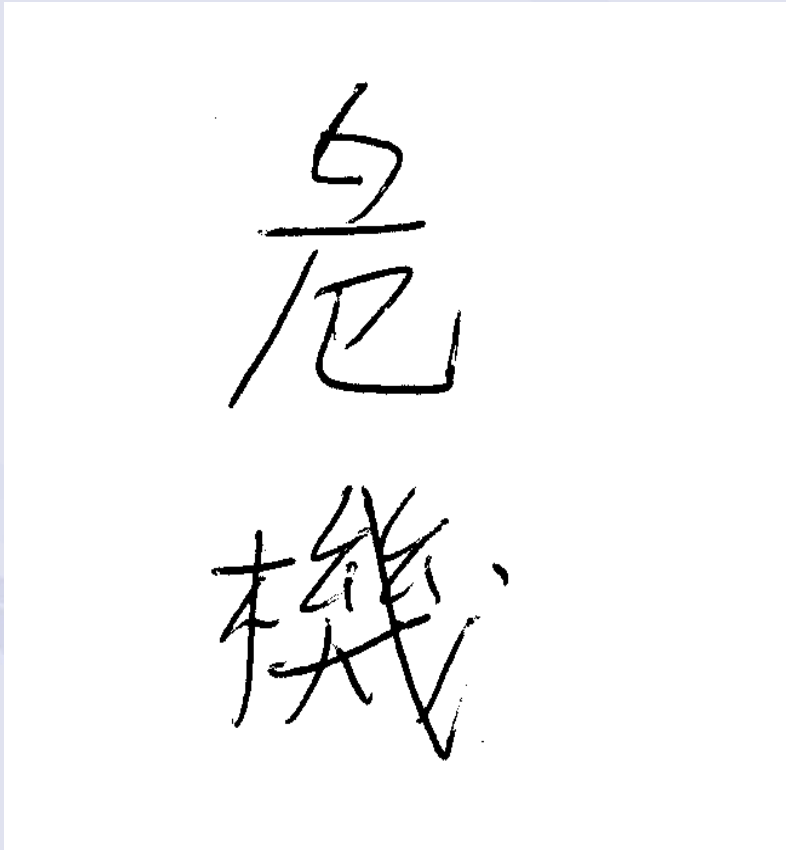
Experience
comes from
Bad Judgment

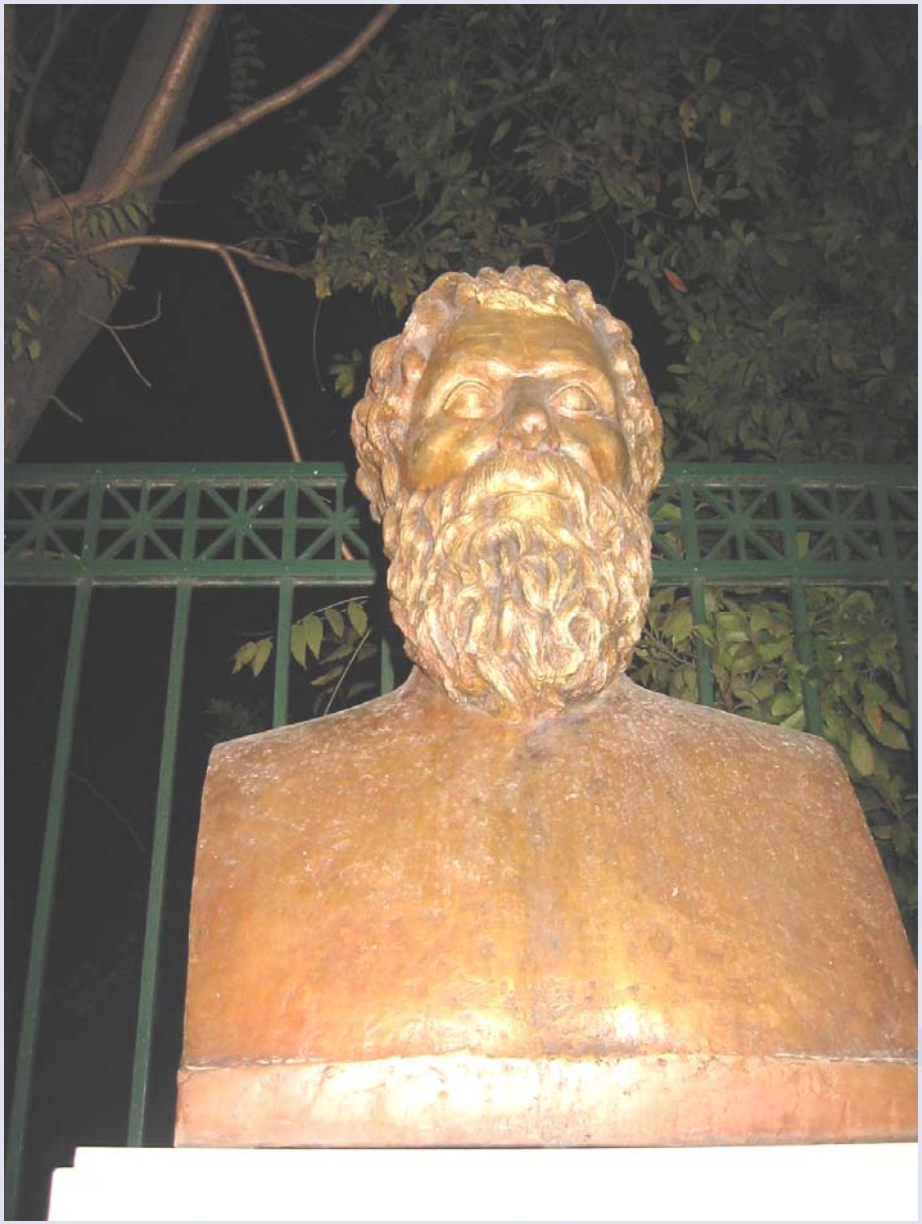
-- Anon

CRISIS

Danger

Opportunity





Knowledge must come through Action

-- Sophocles

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