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PREDICTING QUALITY

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Outline

- Issues
- Data Relationships
- Predicting Quality, a Case Study
- Observations
- Questions?

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Can Quality be Predicted?

“Perfection is the enemy of the possible”

- Voltaire (paraphrased)

“Precision is not accuracy”

- William Horton

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Issues

- What is Acceptable Quality?
    - Cost of Quality vs. Cost of Lack of Quality
- Different Standards and Definitions
    - How Many Severity Levels?
    - What about Changes?
- Lack of Relevant (or any) History
- Variability

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Issues

- Cost of Quality
  - Microsoft Desktop Software vs. NORAD Missile Defense System Software
- Microsoft Business Model
  - Optimize Profit, Maximize Market Penetration, Planned Obsolescence, Increased Expectations
- NORAD “Business” Model
  - Avoid at all Costs False Positives and Negatives
- Cost of Lack of Quality
  - The Unfortunate Fate of Ashton Tate

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Issues

Policies & Procedures Guide Behavior (sometimes poorly)

What is Measured & Monitored is Optimized

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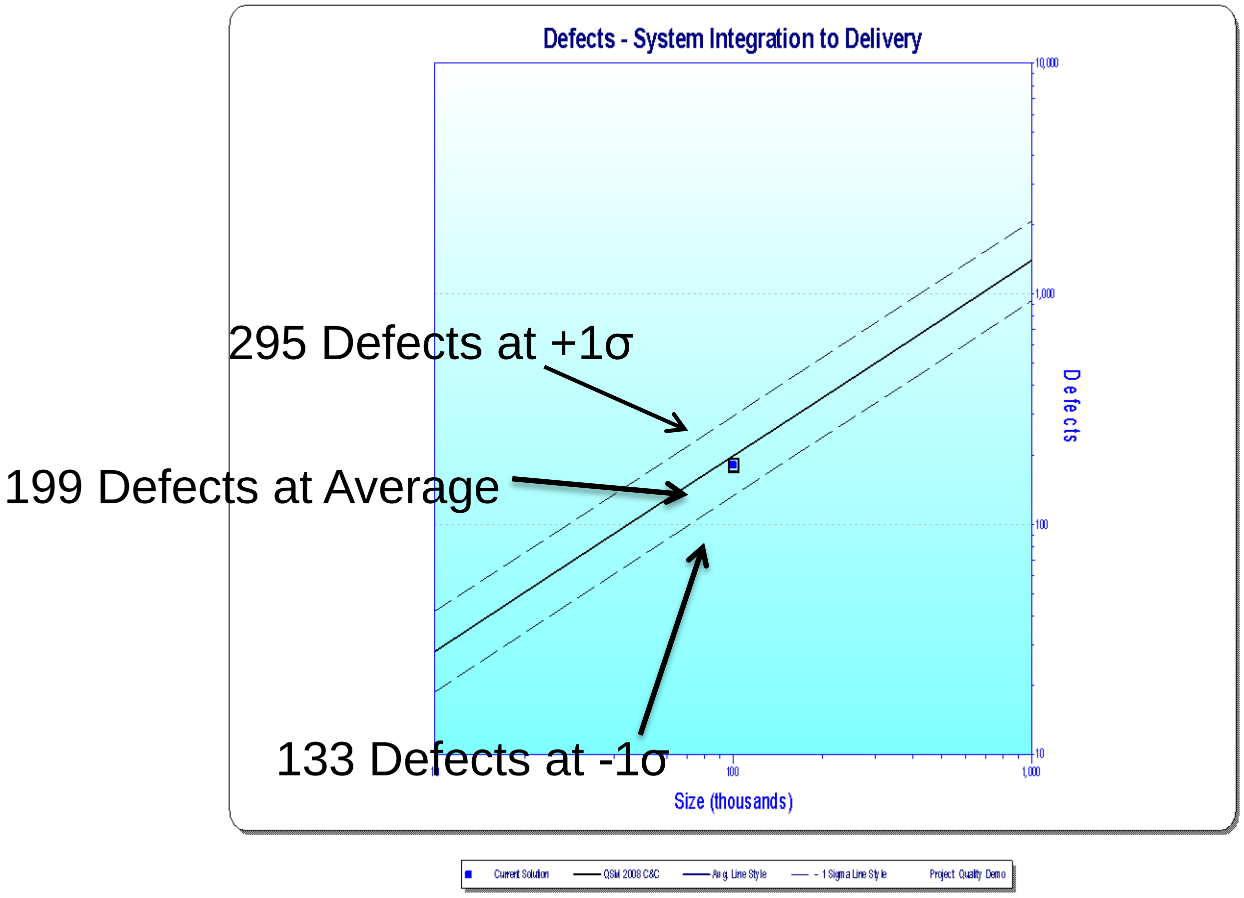
Issues: Variability



Defect Variability for a 100k SLOC
<u>Command & Control System</u>

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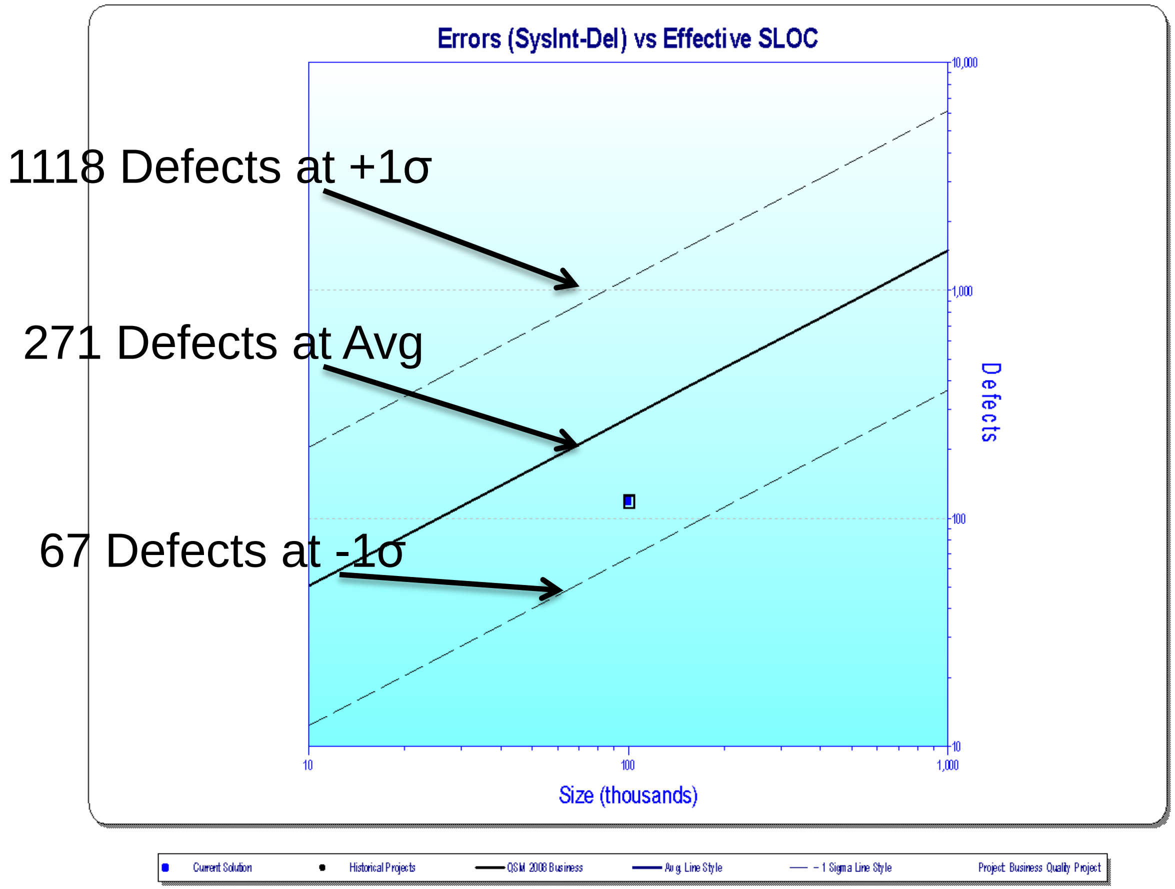
Issues: Variability



Defect Variability for a 100k SLOC
<u>Business System</u>

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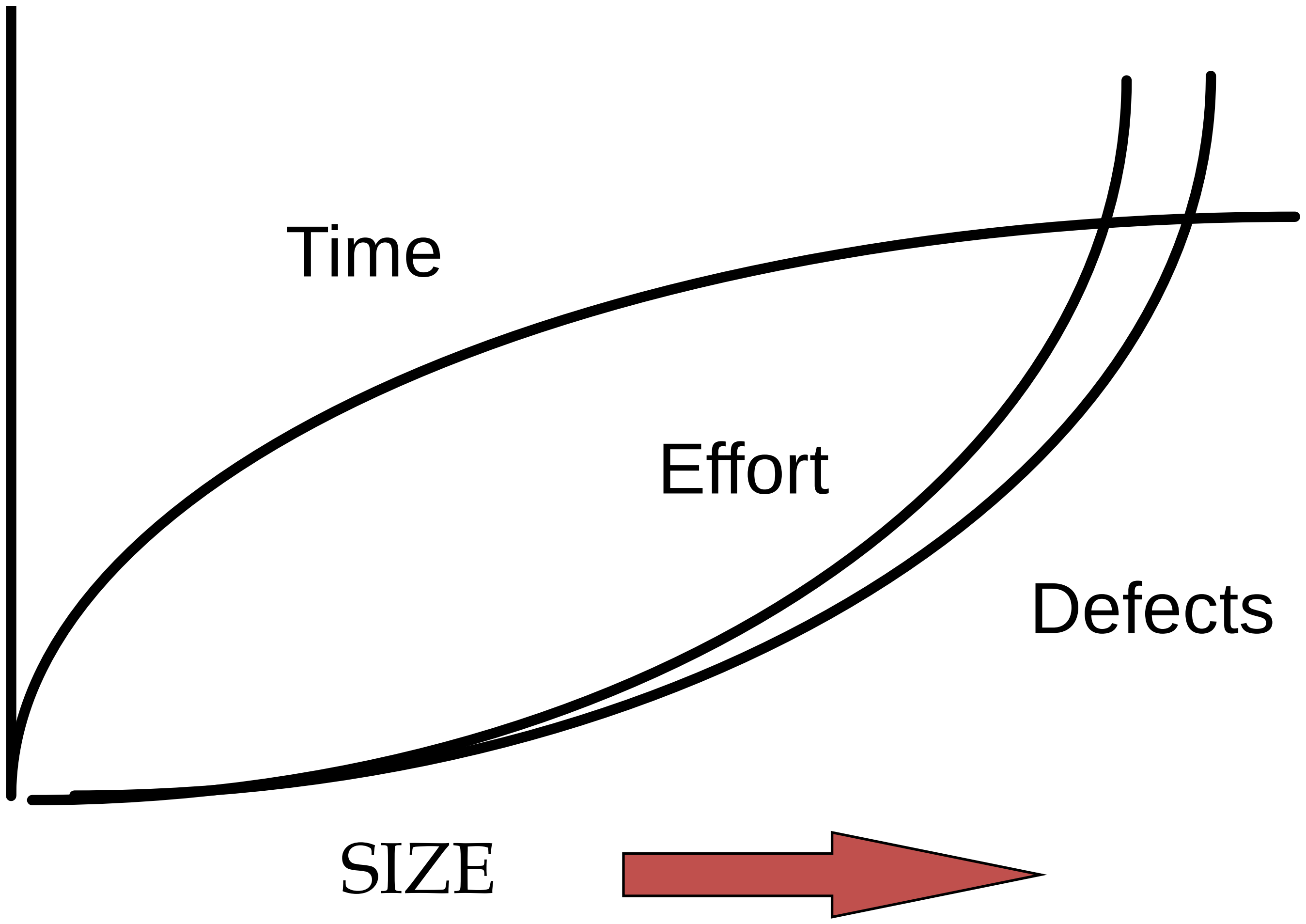
Data Relationships: Time, Effort, Defects



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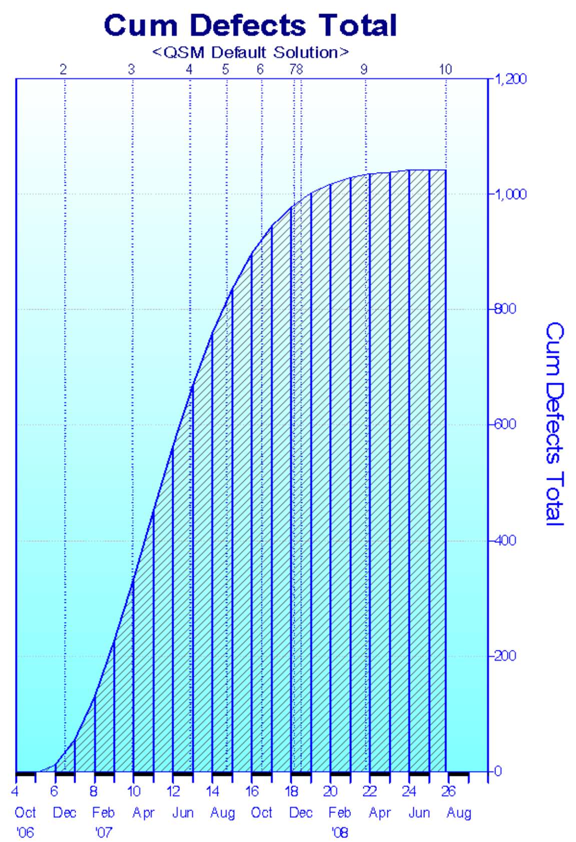
Time/Quality Trade-off

Defect slide



SOLUTION PANEL - <QSM Default Solution>

	C&T	Life Cycle	
Duration	13.4	25.9	Months
Effort	158	225	PM
Cost	2733.1	3899.9	$ (K)
Peak Staff	16.0	16.0	people
MTTD	1.298	56.506	Days
Start Date	11/7/2006	6/1/2006	

PI=15.8 MBI=2.6 Eff SLOC=100,000

Project: Quality Demo

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Time/Quality Trade-off

Schedule/Quality Trade-off				
	Default	10% Compression	20% Compression	10% Extension
Duration Mths	25.9	23.3	20.7	28.5
Defect Count	1,033	1,316	1,715	849
% Change		27.4%	66.0%	-17.8%

100,000 Lines of Code Command & Control Project

Schedule Compression Comes at the Expense of Quality (and Cost)

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Staff / Quality Trade-off

Staff Size / Quality Trade-off			
	Peak Staff 16	Peak Staff 32	% Change
Defects	1043	1411	35%
Effort Mths.	225	392	74%

100,000 Lines of Code Command & Control Project

The Further a Project Deviates from Optimal Staffing and/or Schedule, the More Pronounced the Impact on Cost and Quality

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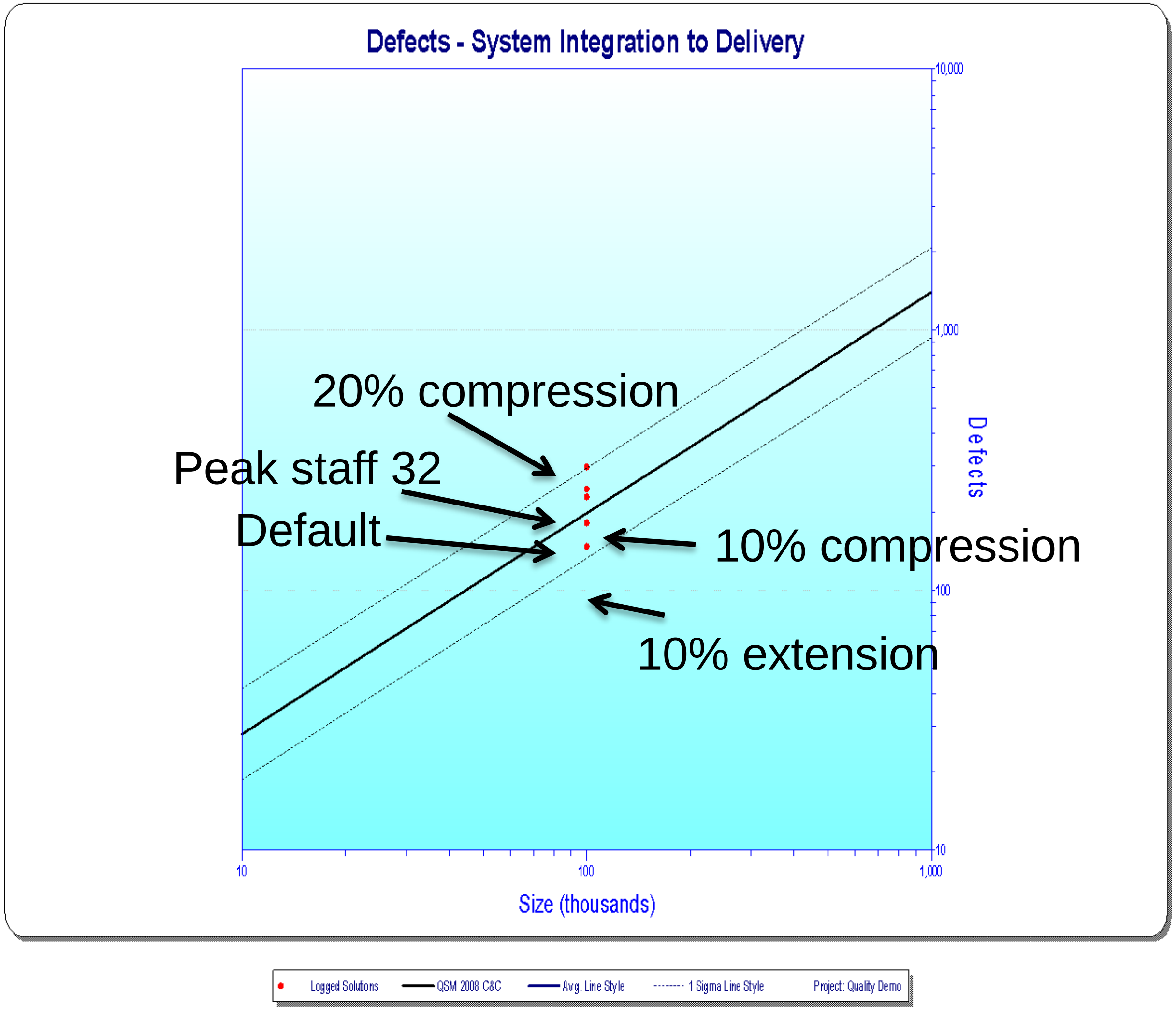
Defect Comparison



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Case Study

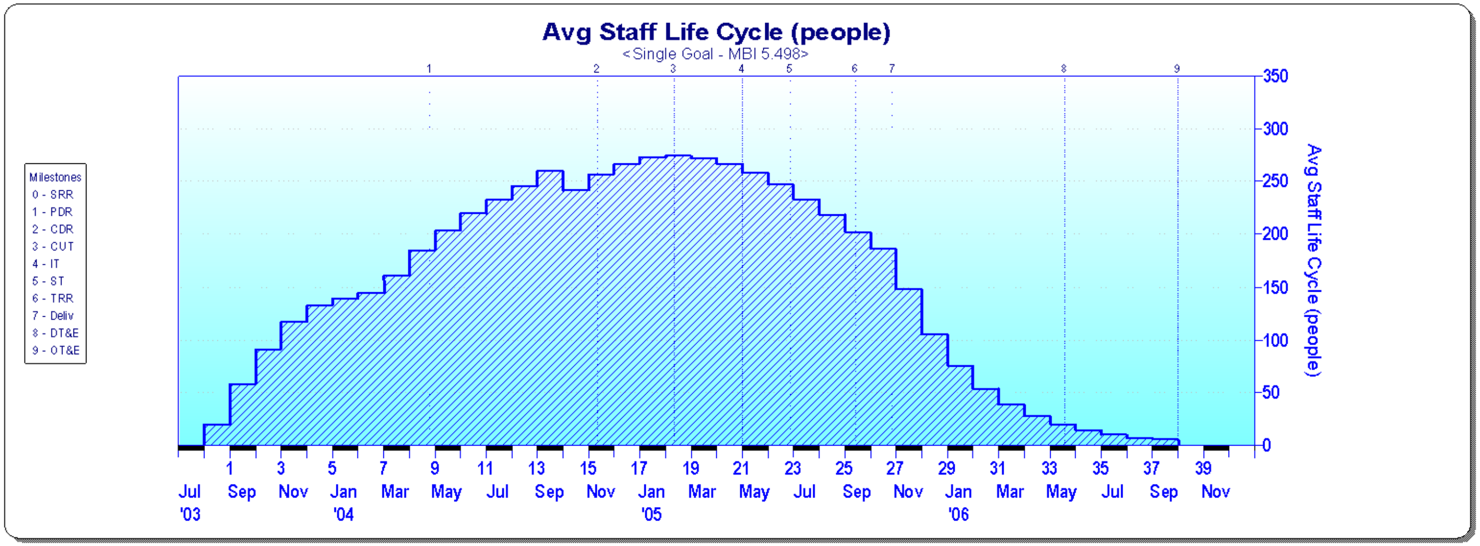
- Huge Multi-year Development Project
  - Around 2.1 Million SLOC
- Hardware & Software Components
- 6 Increments with Significant Inter-Dependencies and Overlap
- Size, Schedule, Staffing Provided from 1st Three (Completed) Increments
- Defect Data Thru Dec., 2008 Provided
- Quality at Deployment Most Critical Factor
- Desired Implementation Date July, 2009

Case Study

- Completed Increments Modeled in Estimating Tool
- Remaining Increments Modeled Based on Demonstrated Productivity & Projected Staffing
- Defects in Models Tuned to Reflect Defects Discovered Thru Dec., 2008
- Increments Combined to Provide Program Level View

Case Study

Staffing & Probability Analysis - MCS Inc003



SOLUTION PANEL - <Single Goal - MBI 5.498>

	C&T	Life Cycle	
Duration	20.3	38.0	Months
Effort	4,120	5,885	PM
Cost	72.1	103.0	$ (M)
Peak Staff	274.4	274.4	people
MTTD	1.18	51.90	Hrs
Start Date	2/19/2004	8/1/2003	

PI=15.9 MBI=5.5 Eff SLOC=523,957

Recreation of Completed Increment

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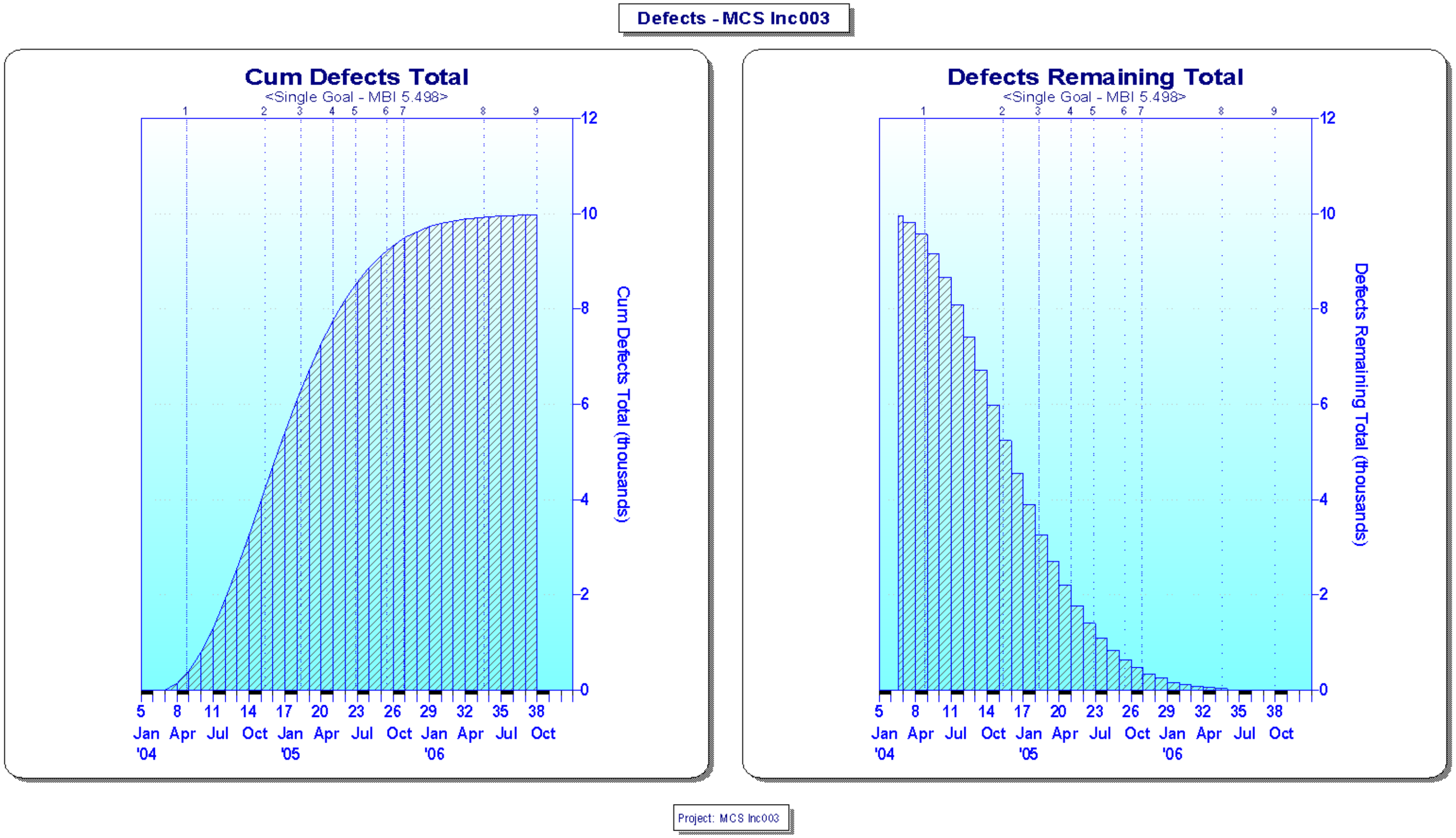
Case Study



Defects Modeled from Actual Performance

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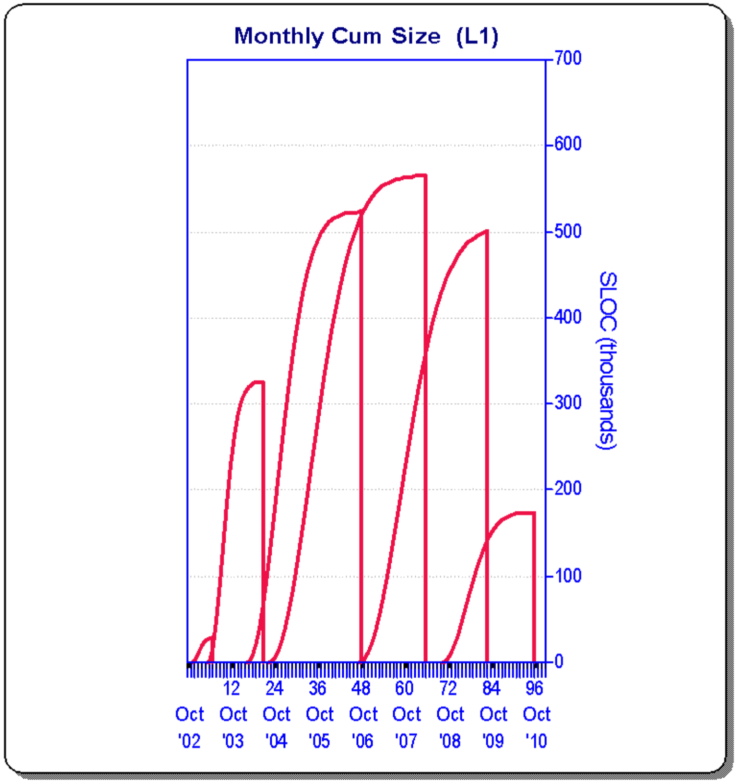
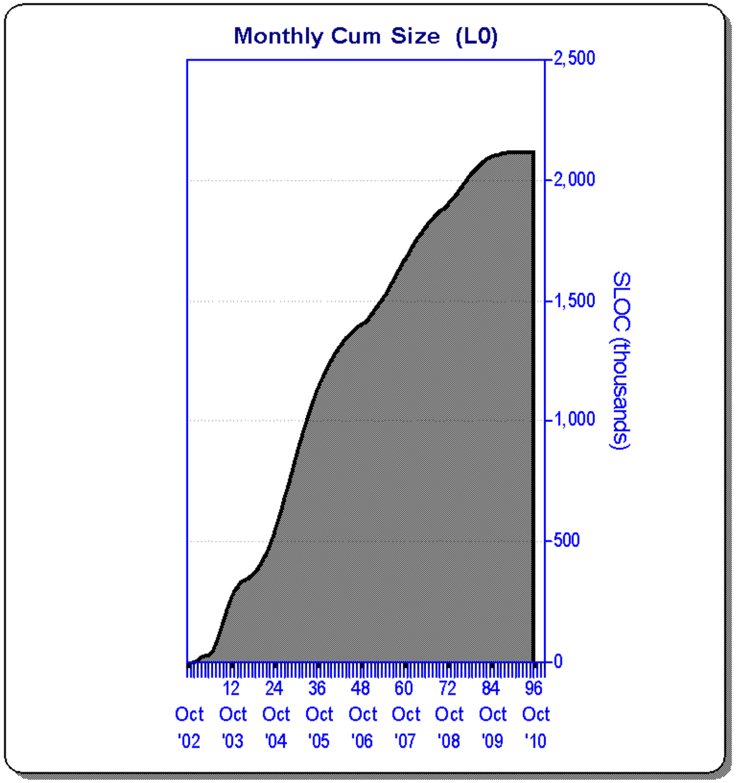
Case Study

Size



By Increment



Cumulative

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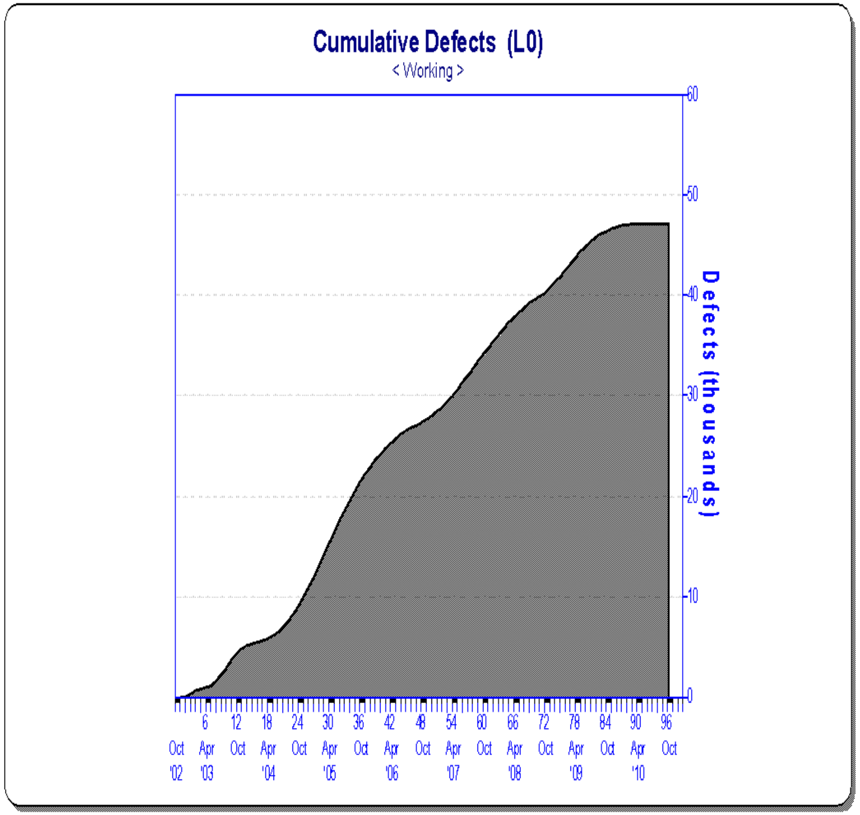
Case Study Calibrated Defect Model



Date	Defects Remaining
Dec 08	5,427
Jan 09	4,801
Feb 09	4,167
Mar 09	3,547
Apr 09	2,960
May 09	2,421
Jun 09	1,940
Jul 09	1,524
Aug 09	1,175
Sep 09	785
Oct 09	577
Nov 09	416
Dec 09	293
Jan 10	202
Feb 10	136
Mar 10	89
Apr 10	58
May 10	36
Jun 10	22
Jul 10	14
Aug 10	8
Sep 10	5
Oct 10	4

390 Defects in First Month of Operation (Aug – 09)

Case Study Observations

- Last Increment Estimated to Complete 10 Months Late
  - Productivity Modeled on Completed Increments
- 1,175 Projected Defects Remaining at Desired Implementation Date (July, 2009)
  - Approximately 1 Defect Encountered for Every 2 Hours of Operation during First Month in Operation
  - Defect Rate Unacceptable

Case Study Conclusion

- Go-Live Date Postponed to Oct., 2010
  - Model Predicts 4 Remaining Defects
  - Initial Defect Rate in Production Around 1 per Month
- Decision to Postpone Implementation May be Result of Schedule Slippage
  - Quality Model Provided Support for Decision

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Case Study

- Strengths
  - Good Project Metrics (Schedule, Size, Defects, Staffing) Make for Better Modeling
  - Defect Rate Close to Industry Average (90%)
- Weaknesses
  - Models for Last 3 Increments are Estimates
    - Assume They Will Behave According to Plan (Schedules for Increments 4 & 5 Did Not)
    - No Way to Determine Potential Impact of Remaining Defects
  - Difficult to Model Interdependencies

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Conclusion

- Modeling is a Useful Tool, when Properly Calibrated, to Predict Residual Defects and Defect Discovery Rates
- Information Valuable in Determining when a Product is Sufficiently Stable to Go-Live

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Key Points

- Organizations Have Quality Profiles that are Strongly Influenced by how they Develop Software
  - Business Model May Play a Key Role
- Historical Performance is a Sound Basis for Predicting Future Performance
- Schedule and Staffing Levels Affect Defect Creation
  - Influence More Pronounced the Greater the Deviation from the Norm
- Modeling can Provide Answers

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Questions?

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