



Cincinnati SPIN

Predictive and Targeted Testing

Wednesday
November 14, 2007

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Quality is the focus of every system we engineer.



Agenda

- Review of Key Principles
- Predictive Approach to Test Planning
- Targeted Testing
- Release Readiness





Fundamental Principles

- Triple constraint
- Test organization has limited control over the quality of the software delivered to them
 - **The measure of productivity for the test organization is cost/defect found**
 - **The measure of quality of testing is defect leakage**
- There are an infinite number of things that a program can do wrong
 - **It is impossible to test for all possible errors**





Fundamental Principles

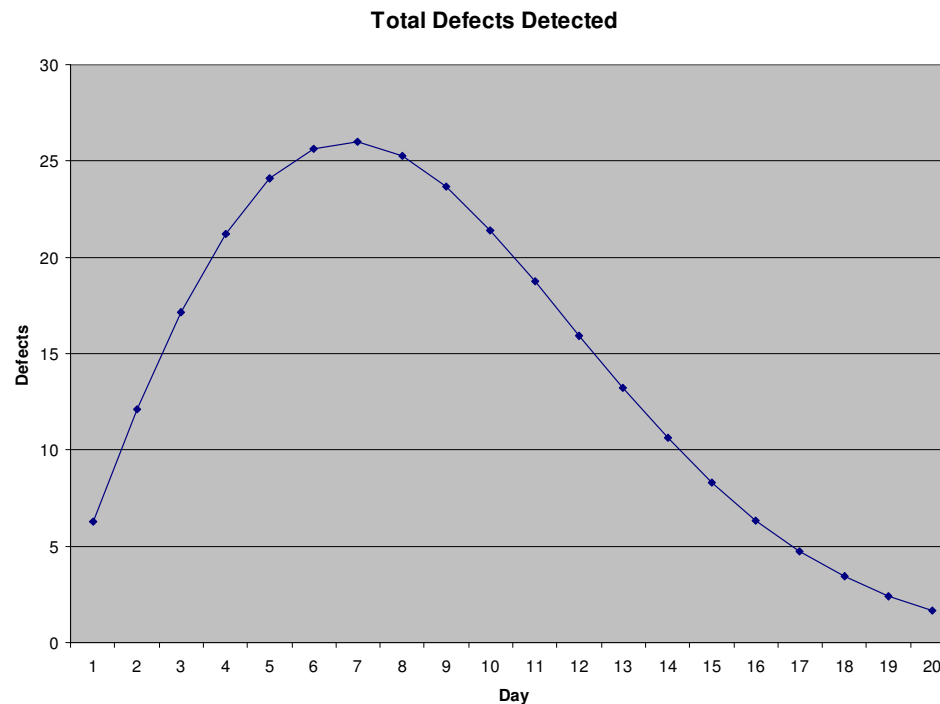
- Exponential cost of defects discovered late in the process
- Definitive measure of software scope, e.g. function points
 - **Key to accurate estimating and measuring productivity**
- “Testing” aka work product inspections, reviews must occur diligently throughout the process





Fundamental Principles

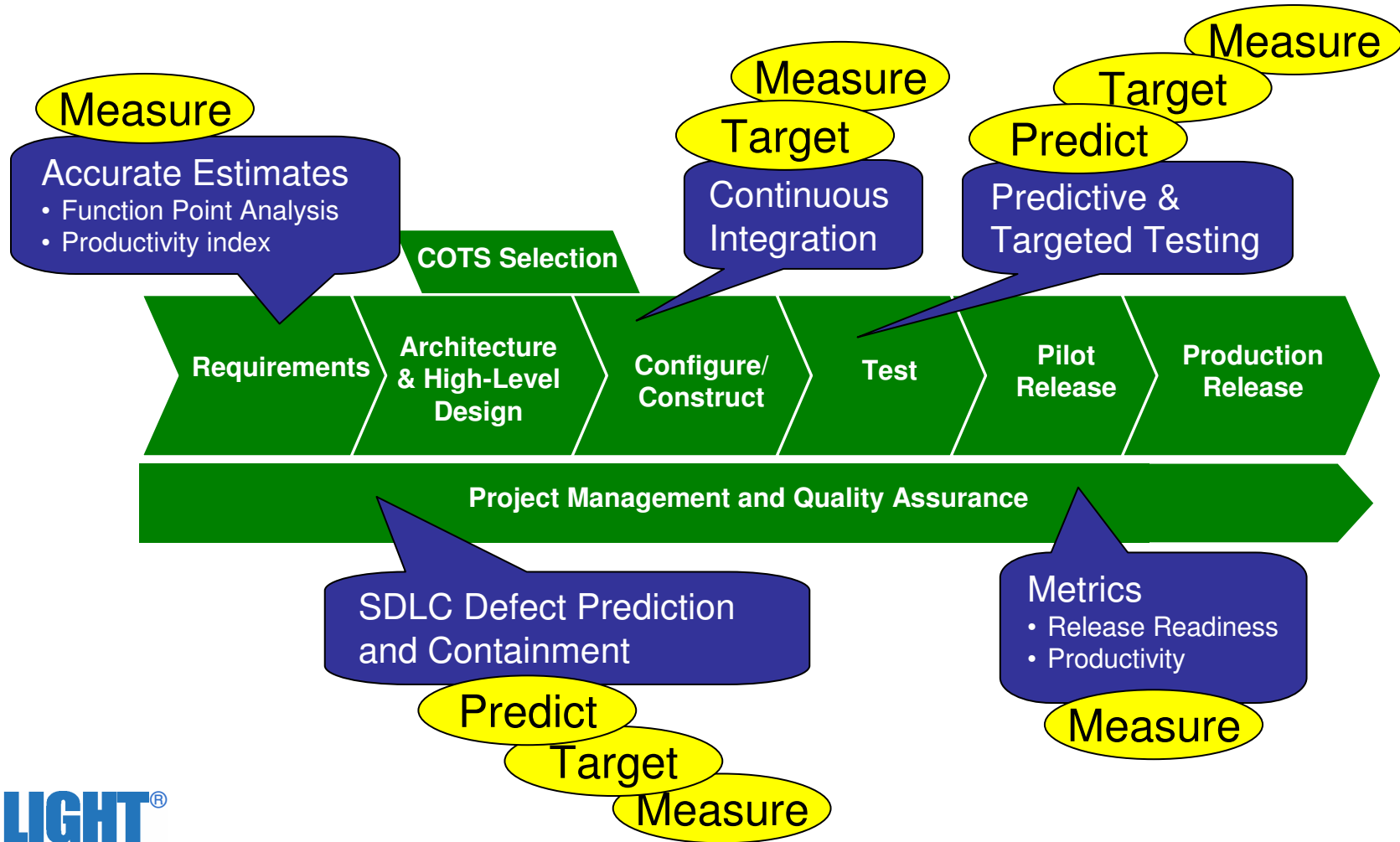
- Defect discovery patterns are best described by the Rayleigh curve



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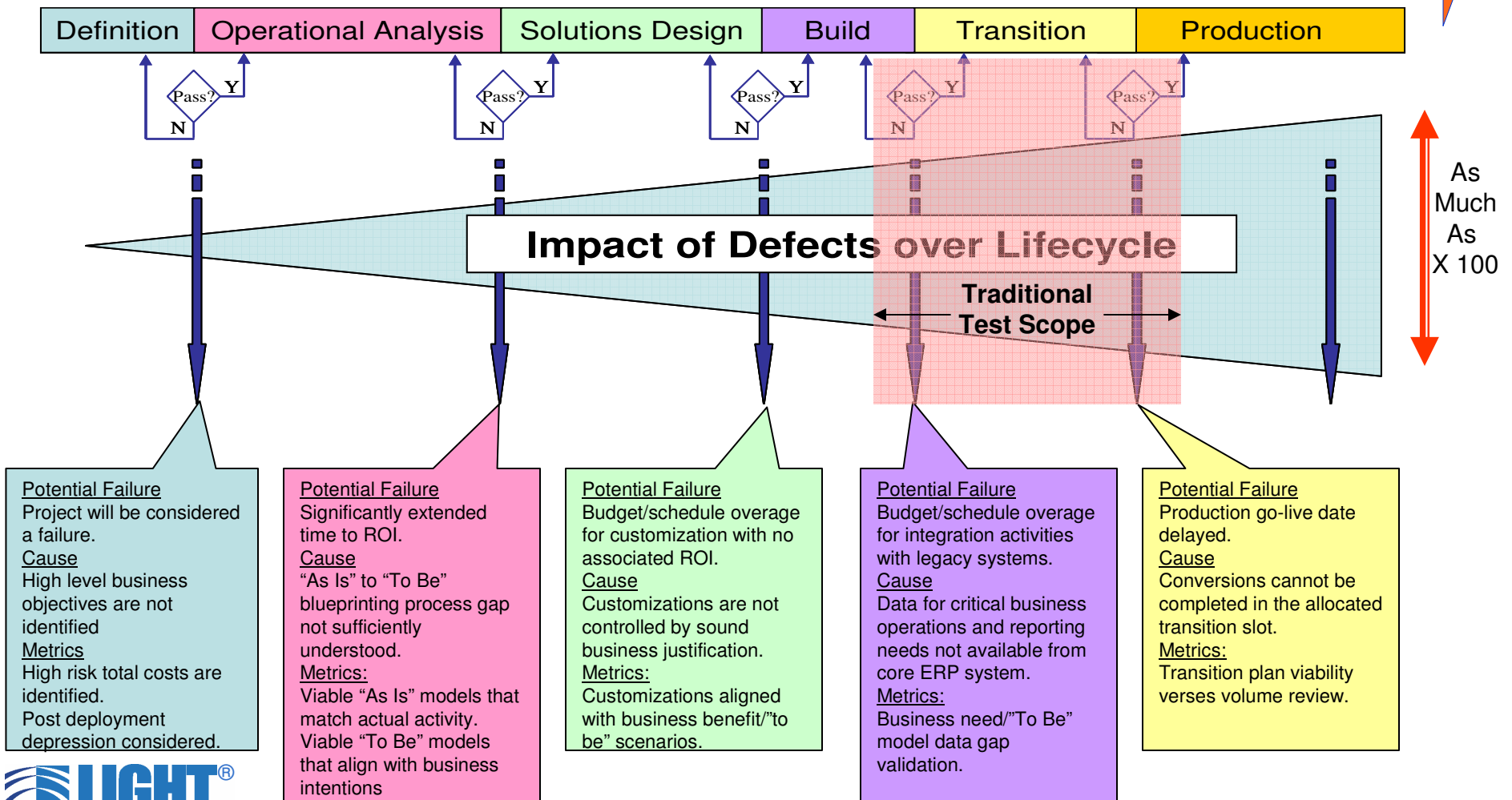


Quality Driven Development and Integration





An Illustration – Impact of Defects through the COTS Deployment Lifecycle



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Predictive Approach

- Why? Software test planning is not simple
 - **How many test cases will be created?**
 - **What are my staffing requirements?**
 - **How long will it take?**
 - **What will it cost?**
 - **How do I know when I'm done?**





Predictive Approach

- What is it?
 - **Prediction of various aspects of the testing phase**
 - **Uses measures of scope, maturity & effectiveness, productivity**
 - **Internal and external benchmarks**
 - **Setting entry and exit criteria**
 - **Controlling to the prediction**





Predictive Approach

- What does it provide?
 - **Better understanding of the test schedule and staffing**
 - **Clear goals for the testing groups**
 - **Lowered risk**

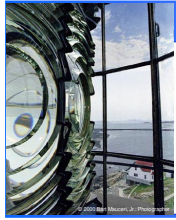




Predictive Approach

- How is it accomplished?
 - **Determine software size in Function Points or KLOC**
 - **Determine development maturity (and associated defect injection and removal effectiveness based upon industry benchmarks)**
 - **Staff size and/or required schedule**
 - **Required quality levels**
 - **Use Rayleigh curve as the model for defect discovery**





Predictive Approach

- Case studies
 - **Large custom retail system**
 - **Business intelligence system**
 - **Large Oracle ERP system**
 - **Investment trading application**
 - **Bank branch automation**

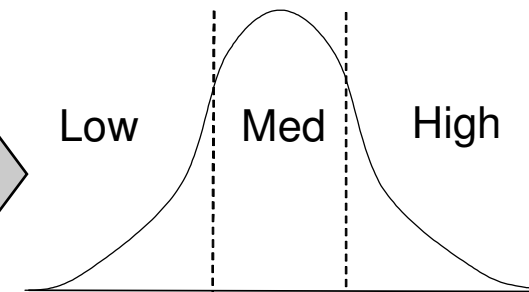
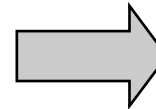




Targeted Testing

- Maximize system test productivity
 - Increase utilization of test resources
 - Identify “High” risk modules/functions
 - Apply key measures to determine targets
- Complexity
 - Frequency of use
 - Critical function
 - New features
 - Compliance issues
 - High number of changes
 - High defect history
 - High defect history
 - SME Opinion

Activity, Process, test case	Module	Targeted? Yes or No	New Feature	Defect Prone	Defect Analysis	Hot Fix	Cyclomatic Complexity	Freq of Use	High Change	Compliance	SME Opinion





Targeted Testing

- Cyclomatic Complexity
 - **Complex modules are error prone**
 - **McCabe metric based on the number of paths through a module***
 - Modules with an index > 10 very error prone
 - Analysis can be used to identify complex modules
 - **Focus additional testing**
 - **Code inspections**
 - **Rewrite/refactor**





Targeted Testing

- Cyclomatic Complexity

			Number of paths through the Code
If	B1		
	then	P1	
	else	P2;	$2^1 = 2$
If	B2		
	then	P3	
	else	P4;	$2^2 = 4$
	.		
	.		
If	B10		
	then	P19	
	else	P20;	$2^{10} = 1024$

The exponent is the cyclomatic complexity number. Normally 10% of the code has a cyclomatic complexity > 10 and 50% of the defects are in this portion of the code.





Targeted Testing

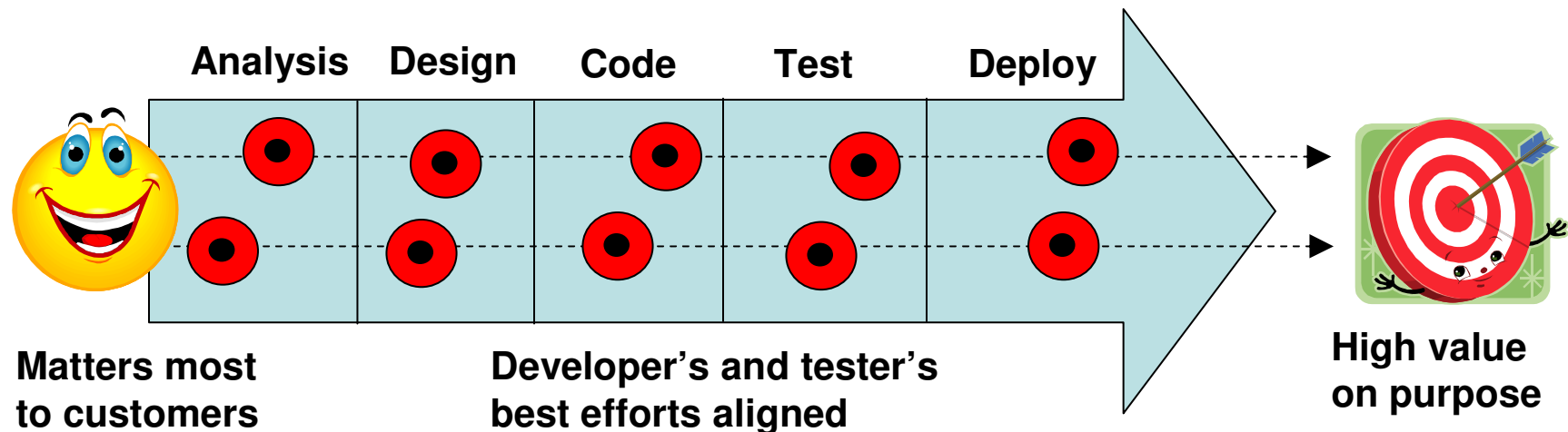
- Cyclomatic Complexity
 - **Case studies**
 - Self service kiosks
 - Investment trading application





Targeted Testing

- Key functionality via “coherent development”





Release Readiness

- A “few good metrics”
 - **High severity defects/day**
 - **Open defect backlog**
 - **Predicted vs. found defects**
 - **Mean time to defect (MTTD)**

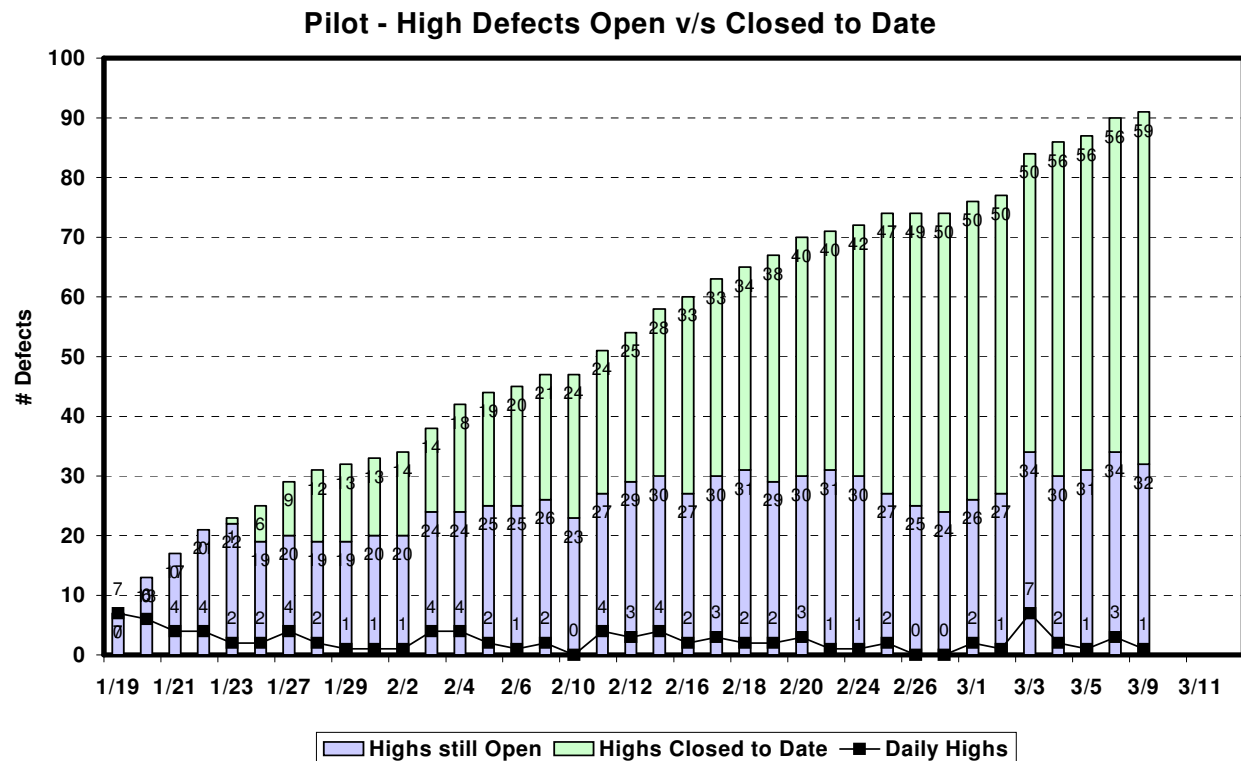




Release Readiness

- High severity defects/day

- Measures release readiness
- Requires defect tracking data
- Exit criteria threshold
- Shows rate of open to closed high defects



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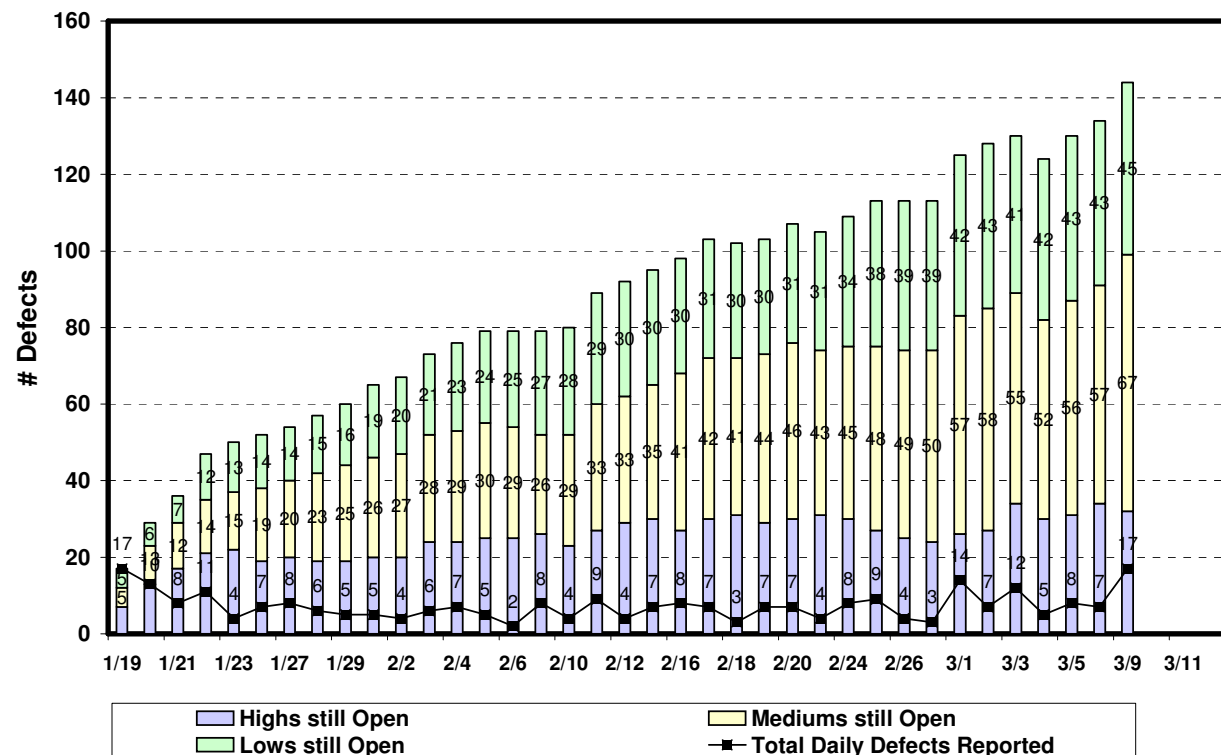


Release Readiness

- Open defect backlog

- Measures release readiness
- Requires defect tracking data
- Exit criteria threshold
- Shows growth of all defects over time

Pilot - Open Defects

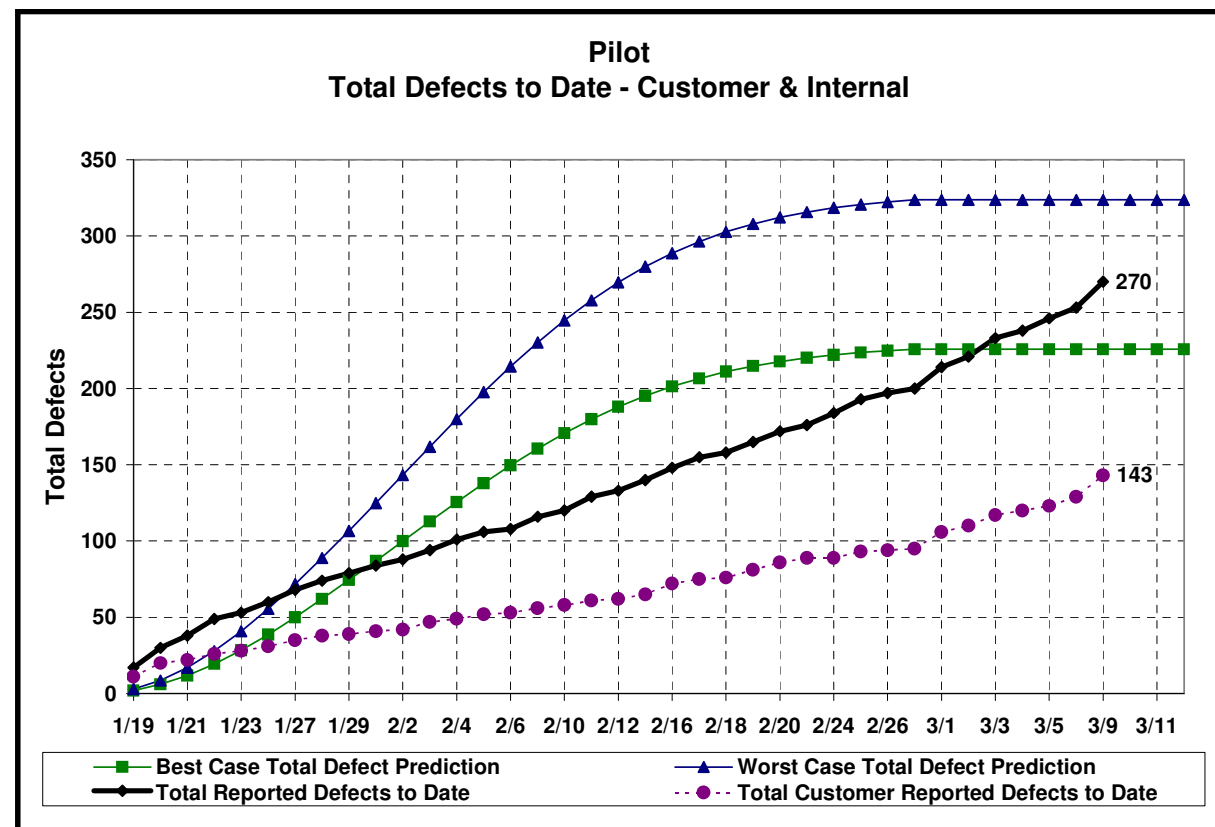




Release Readiness

- Predicted vs. found defects

- Measures release readiness
- Requires defect tracking and defect prediction data
- Exit criteria low and high thresholds
- Quantity and slope provide meaning



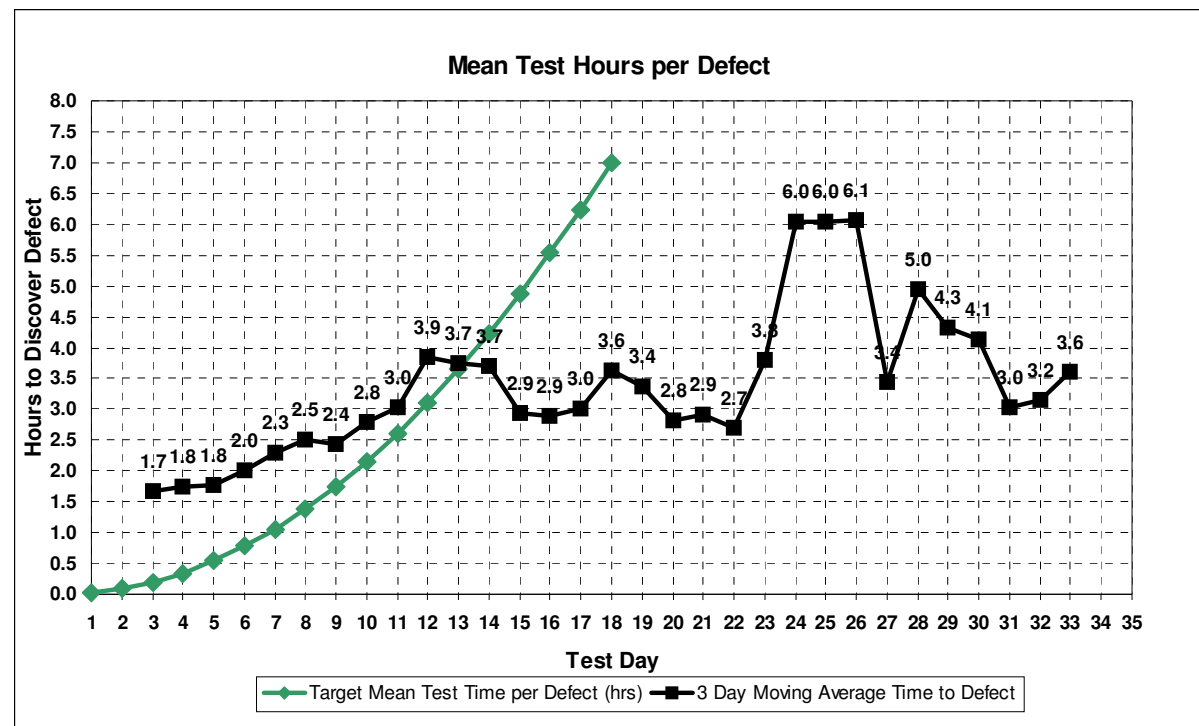
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Release Readiness

- Mean time to defect (MTTD)

- Measures release readiness
- Requires defect tracking and defect prediction data
- Exit criteria threshold
- As defects are reduced, the time to discover them increases



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Summary

- Remember the key principles.
- Testing is an engineering process. It can be measured, studied and modeled. Use benchmarks.
- Take a lesson from Pareto and target, target, target.
- Release based upon a balanced scorecard, not a fixed interval.





Thank You!

Questions?



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