



Bug-Free Code

A Case Study You Can Use

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Nancy V's Background

- 20+ Years design and implementation of large real-time systems, electronics & software
- Industries: Scientific Instruments, Medical Devices, Sonar Weaponry, Aerospace (flight simulation)
- Pioneered 'Extreme Programming' for embedded systems development, 1999
- Co-author of Catsrunner TDD framework for embedded C software, 2005
- Present: Principal Agile Enterprise Coach at Lean-Agile Partners. Coaching managers and teams worldwide



Grain Monitor System (GMS)



- Measures protein, oil in corn, wheat, etc. in seconds
- Based on new science, new CPU, new OS port, new NIR sensor, new algorithm...
- Agile team delivered 1st field units in 6 months



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Opportunity & Vision

- Chance to do “clean start” product
- Combine proven new techniques

- Expected 20-30% improvement
- BUT wanted data, not just anecdotes
 - Duration
 - Effort
 - Reliability (Defects)
 - Size




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Risks

- New microprocessor
- First port of operating system
- New scientific concept
- Rugged env; vibration, temperature, etc.
- Low-noise, sensitive circuitry
- Team with no multitasking experience
- Little embedded experience on team
- Company not used to commercial dev
- New partnership with another company




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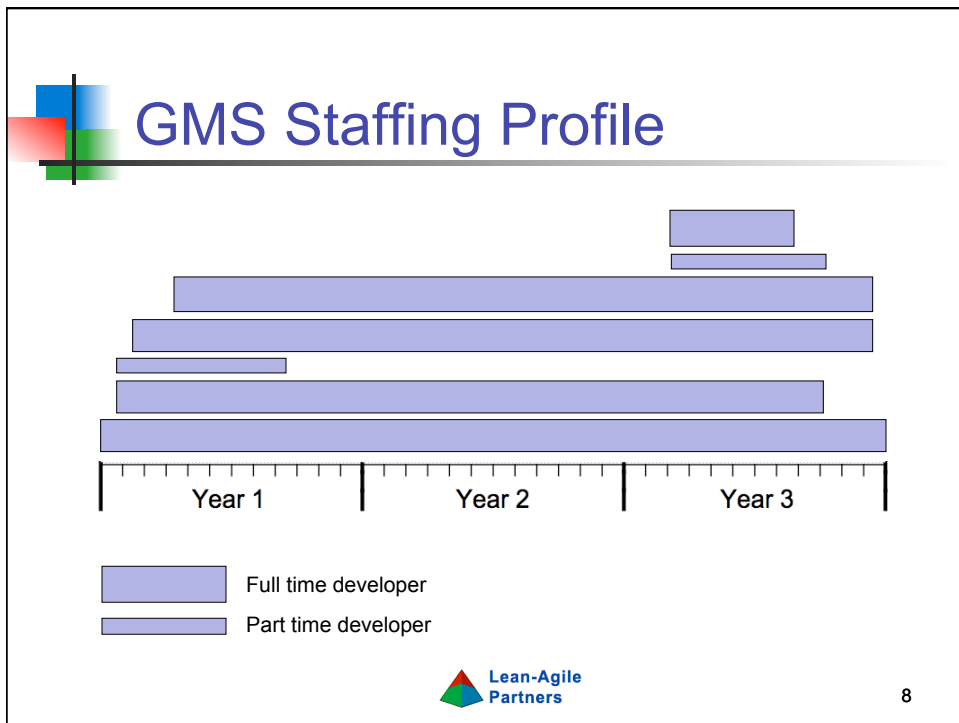


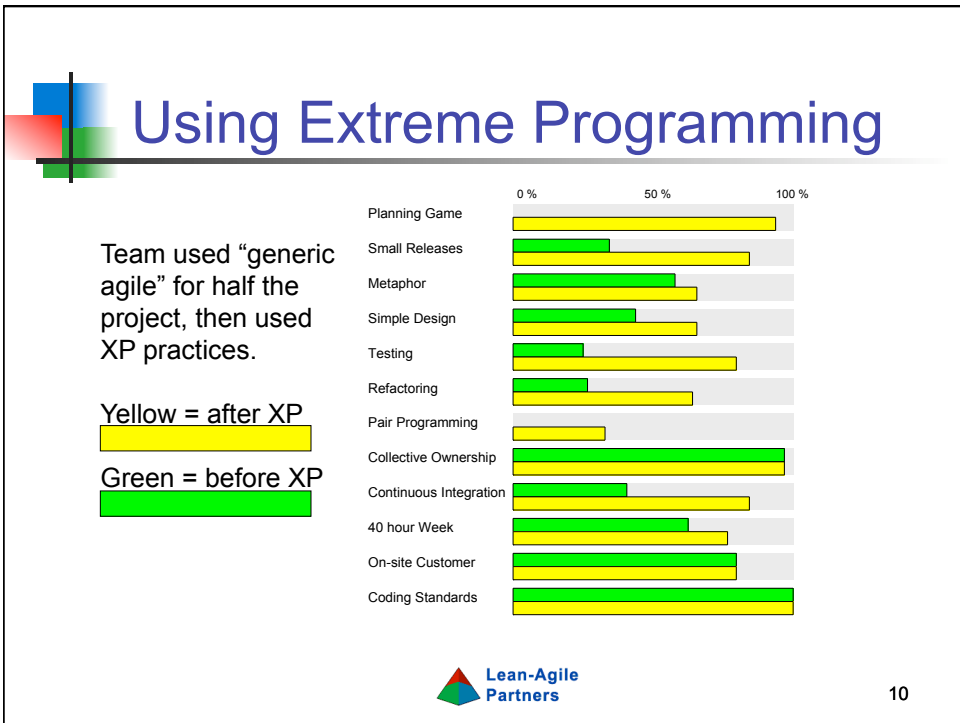
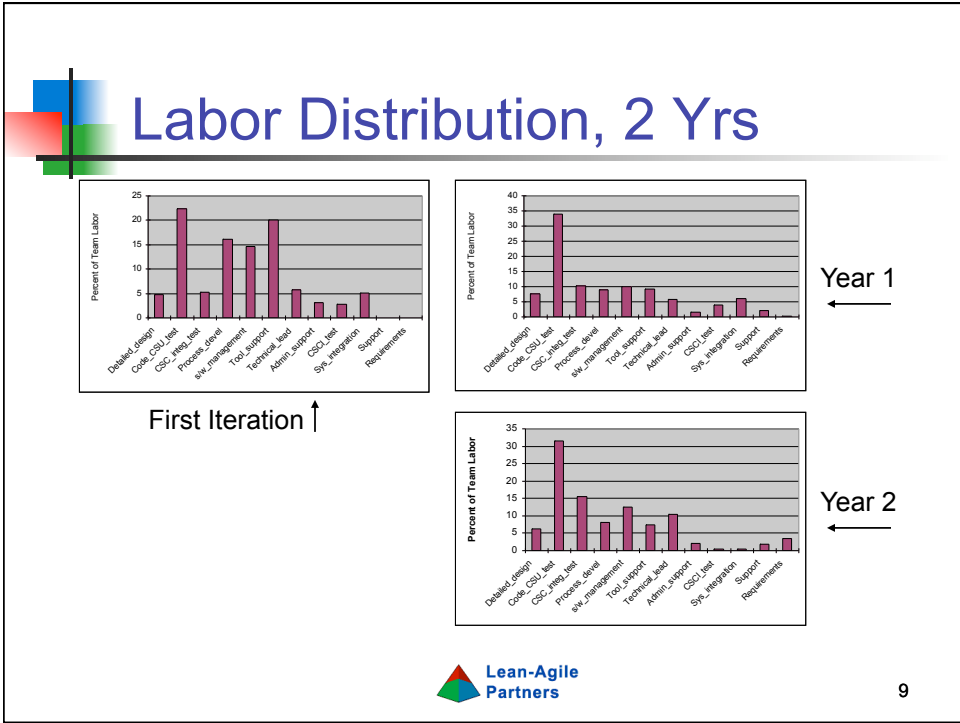
Results

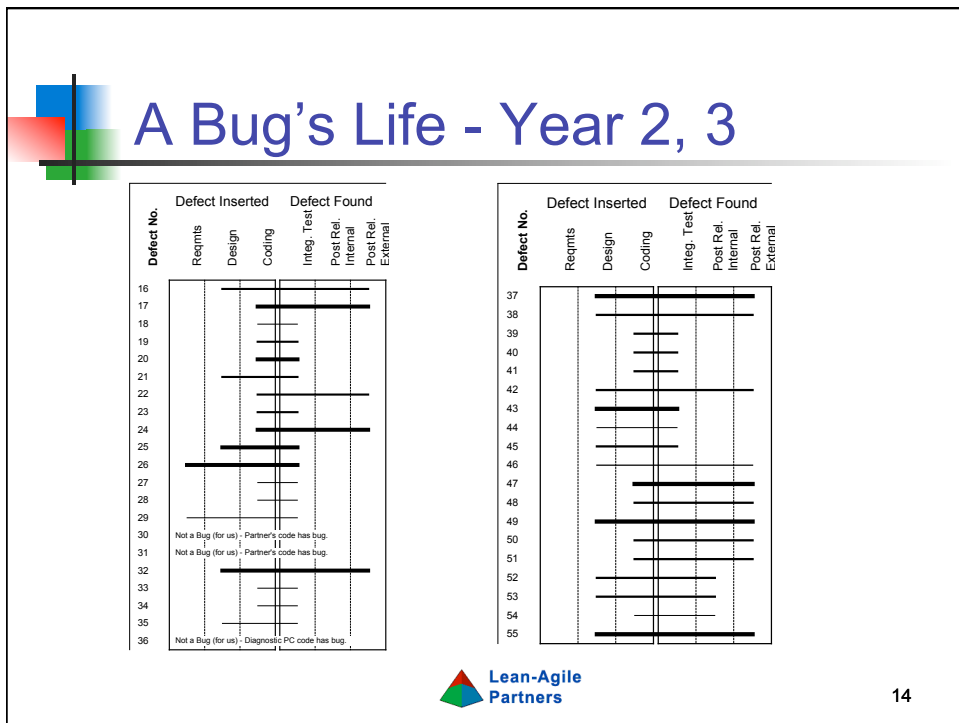
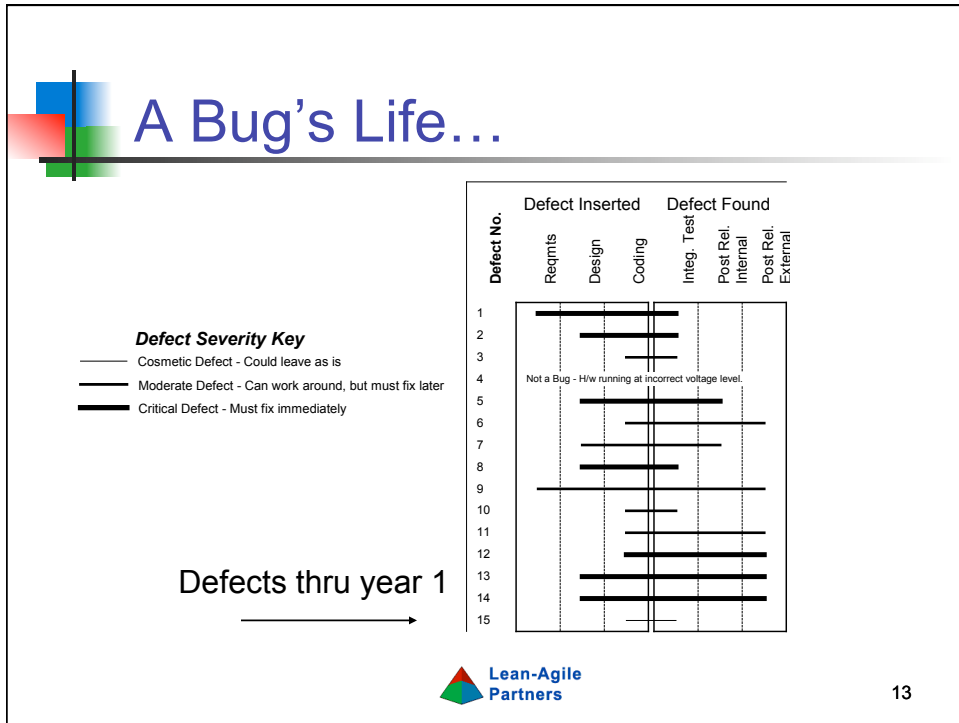
- 29,500 lines of tested, working embedded code delivered (count omits comments)
 - 5,000 lines Windows utility code (VB)
 - 2,000 lines Perl code (Calibration Table builder utility) + other utility code
- 51 bugs total for project, active list <2 bugs
- Productivity approx. 300% of norm
- Stable software throughout development

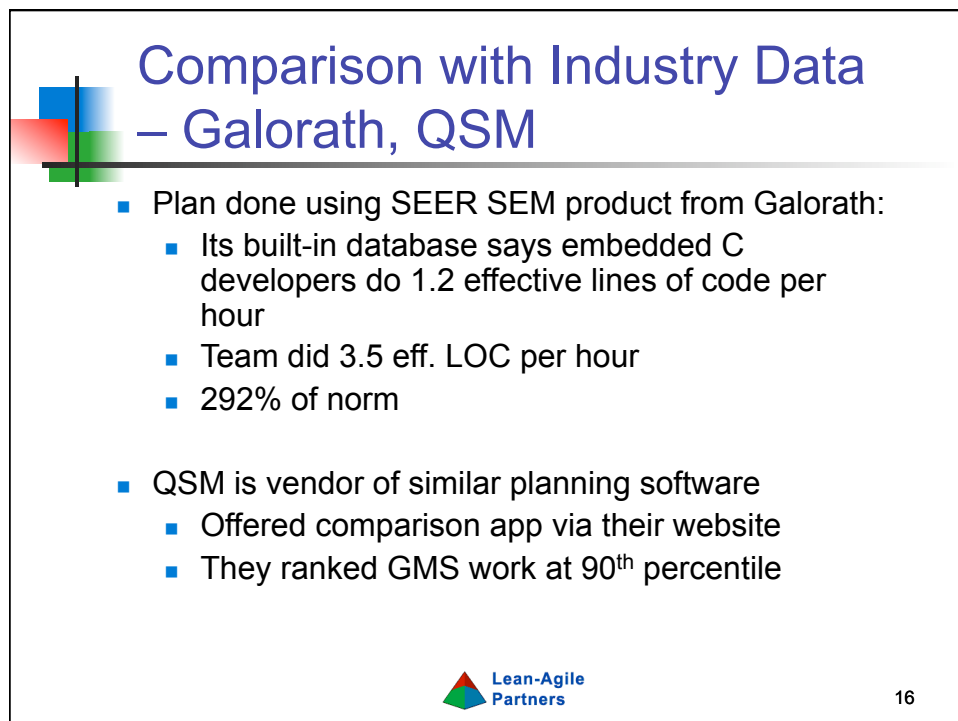
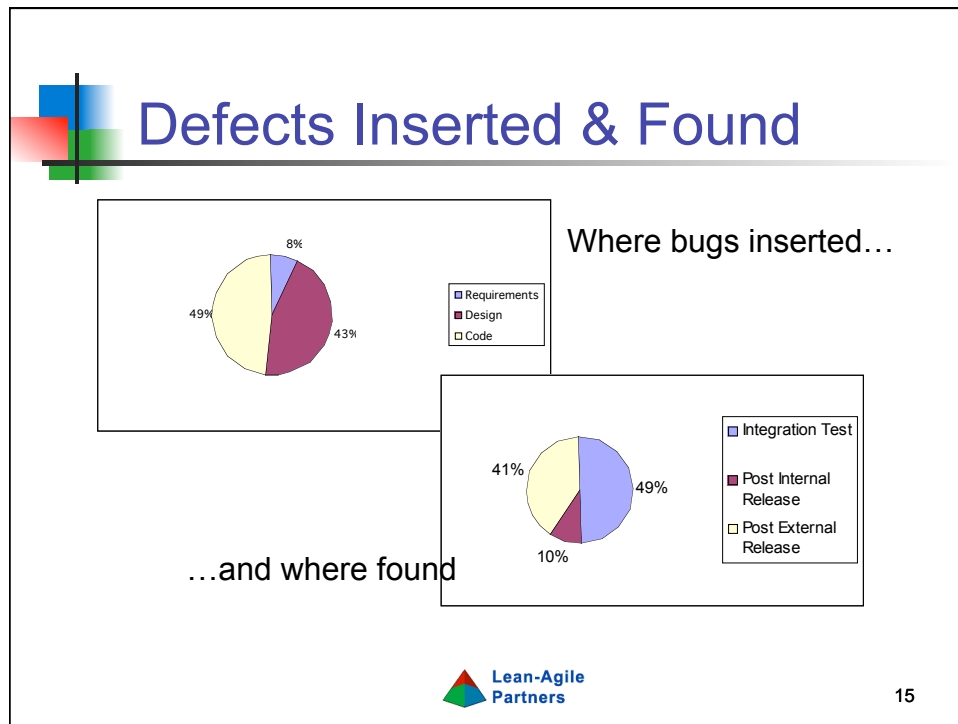


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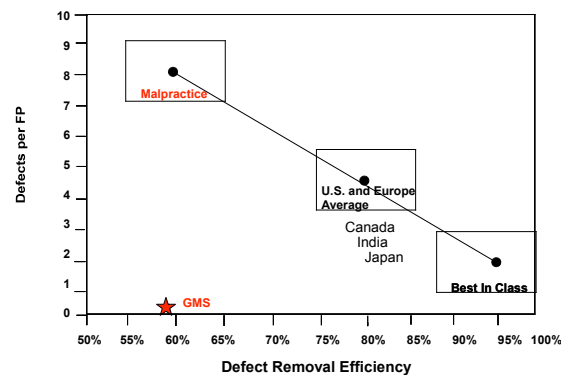






Comparison with Industry Data – Capers Jones

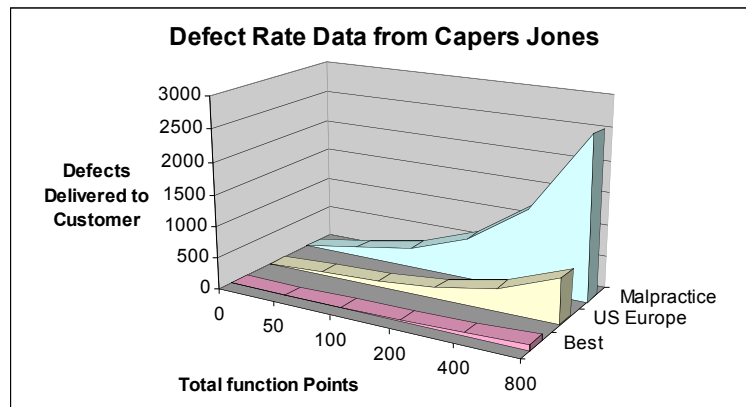
MAJOR SOFTWARE QUALITY ZONES



Best-In-Class Comparison


- $\text{GMS Function Points} = 29500/128 = 230$
- $\text{GMS Defects per Function Point} = 51/230 = 0.22$
- $\text{Defect Removal Efficiency} = (30/51) * 100 = 58.8\%$
- $\text{Defects to customer} = \text{Total FP} * \text{defects per FP} * (1.0 - \text{defect removal efficiency})$
- $\text{B.I.C. bugs to cust.} = 230 * 2 * (1.0 - 0.95) = 23$
- $\text{GMS bugs to cust.} = 21$

Defects Delivered to Customer




GAMP Audit

- Big pharma company as possible partner with our company
- Spectroscopy for blood analysis, etc.
- First needed to audit the S/W dev process
- Findings: “This team does practice x, which we recommend, but the company does not require all S/W teams to do it”




Conclusions

- No correlation between size of code base and bug rate: Complexity handled completely!
- Newbies performed with the best in industry
- If the knowledge exists on the team, Agile can distribute it quickly and safely




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References

This presentation is based primarily on this experience report paper:

- Nancy Van Schooenderwoert, “Embedded Agile Project By the Numbers with Newbies” presented at Agile 2006, Minneapolis MN, July 2006, available at <http://www.leanagilepartners.com/publications.html>
“This paper is quite an impressive piece of work” – Capers Jones, Chief Scientist Emeritus, SPR, Inc.
- Capers Jones, “Software Quality in 2002” presentation for Boston SPIN, Oct 2002. See <http://www.boston-spin.org/talks.html#yr2001>



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Our specialties:

- Agile management coaching
- Embedded and safety-critical systems
- ETL and data migrations

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