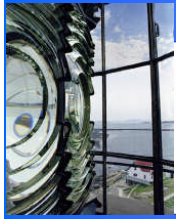


Stable software. Engineered.

Quality is the focus of every system we engineer.



Agenda

- **QA Principles**
- **QA in Practice**
- **QC Principles**
- **QC in Practice**
- **Quality Metrics for Earned Value**





Definition of QA and QC

- **Quality Assurance**

The proactive, systematic activities implemented within the quality system providing confidence a product or service will fulfill requirements for customer's explicit and implicit needs.

- **Quality Control**

The planned, measured, testing activities within the quality system identifying defects in a product or service prior to release to the customer.





QA Principles

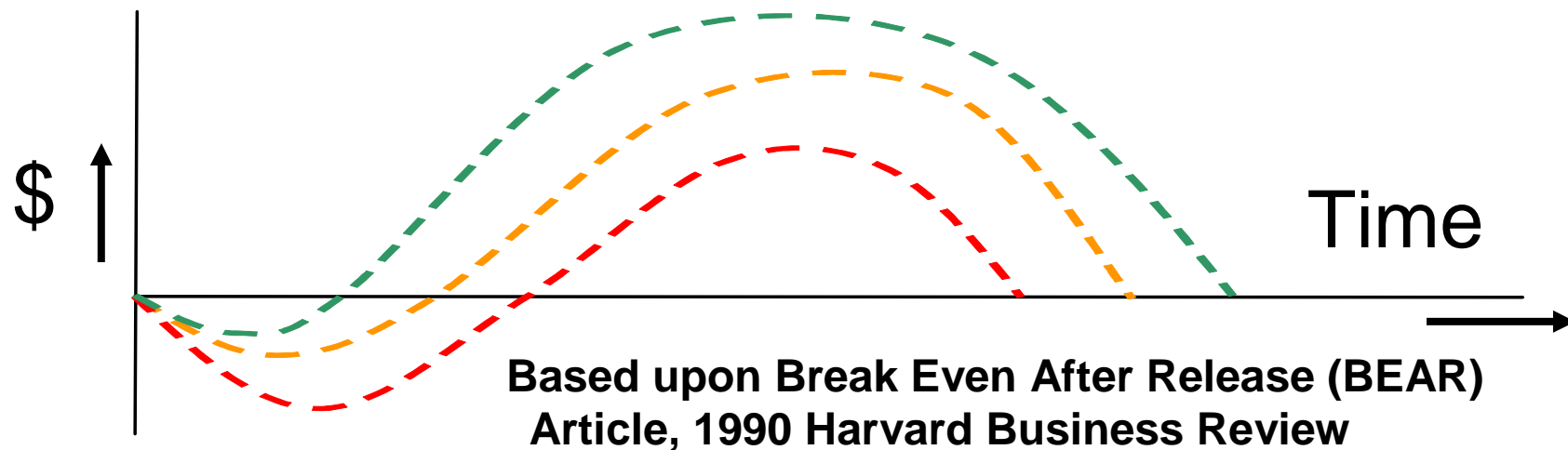
- **Impact of Quality on Revenue is high**
- **There is a potential for defects in all work products**
- **The fewer defects created, the fewer that need to be found**
- **Getting defects out early during a software development is cheaper and saves schedule**





Quality Drives Revenue

- Hard to sell
- Few reference accounts
- Late revenue realization
- Decrease in total revenue



Only 50% of planned market penetration with 80% defect-free code.





Reduce Number of Defects Created

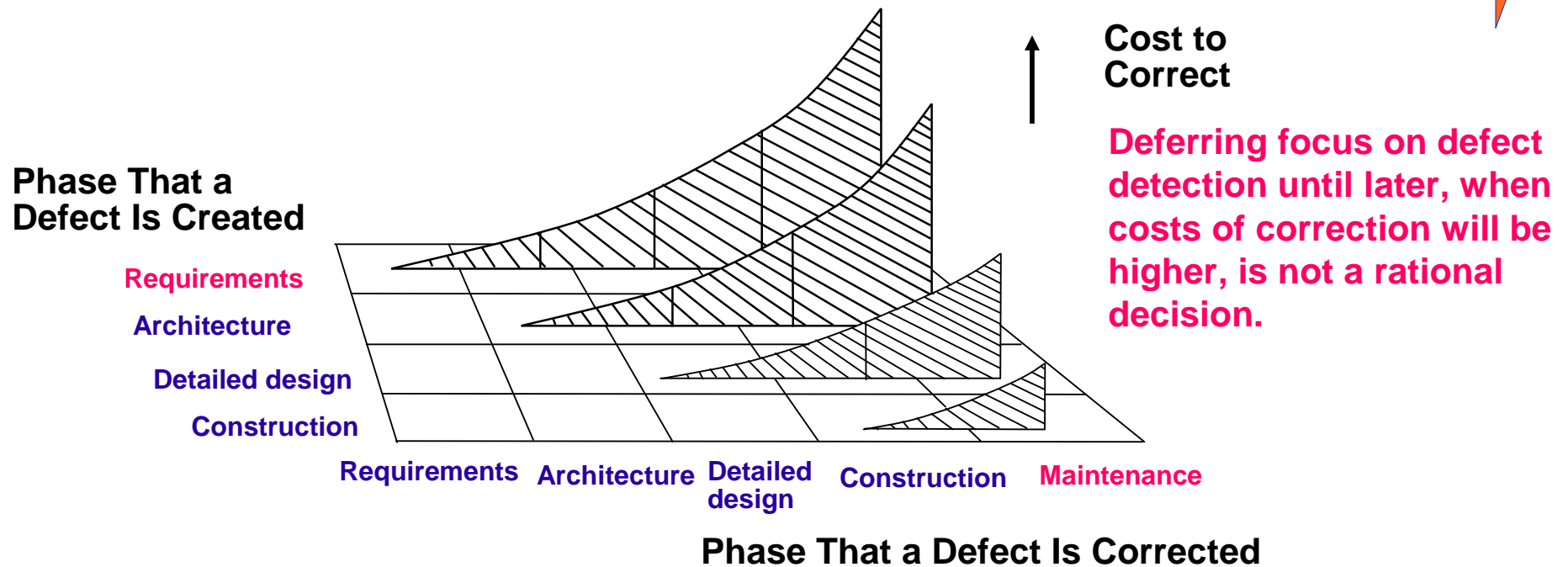
- **Test and train people**
- **Ensure good critical path management**
- **Follow documented processes**
- **Keep size manageable**
- **Keep organization simple**
- **Measure cyclomatic complexity**
- **Use appropriate tools**



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Impact of Correcting Defects Late



Increase in defect cost as time between defect creation and defect correction increases. Effective projects practice “phase containment”—the detection and correction of defects in the same phase in which they are created.

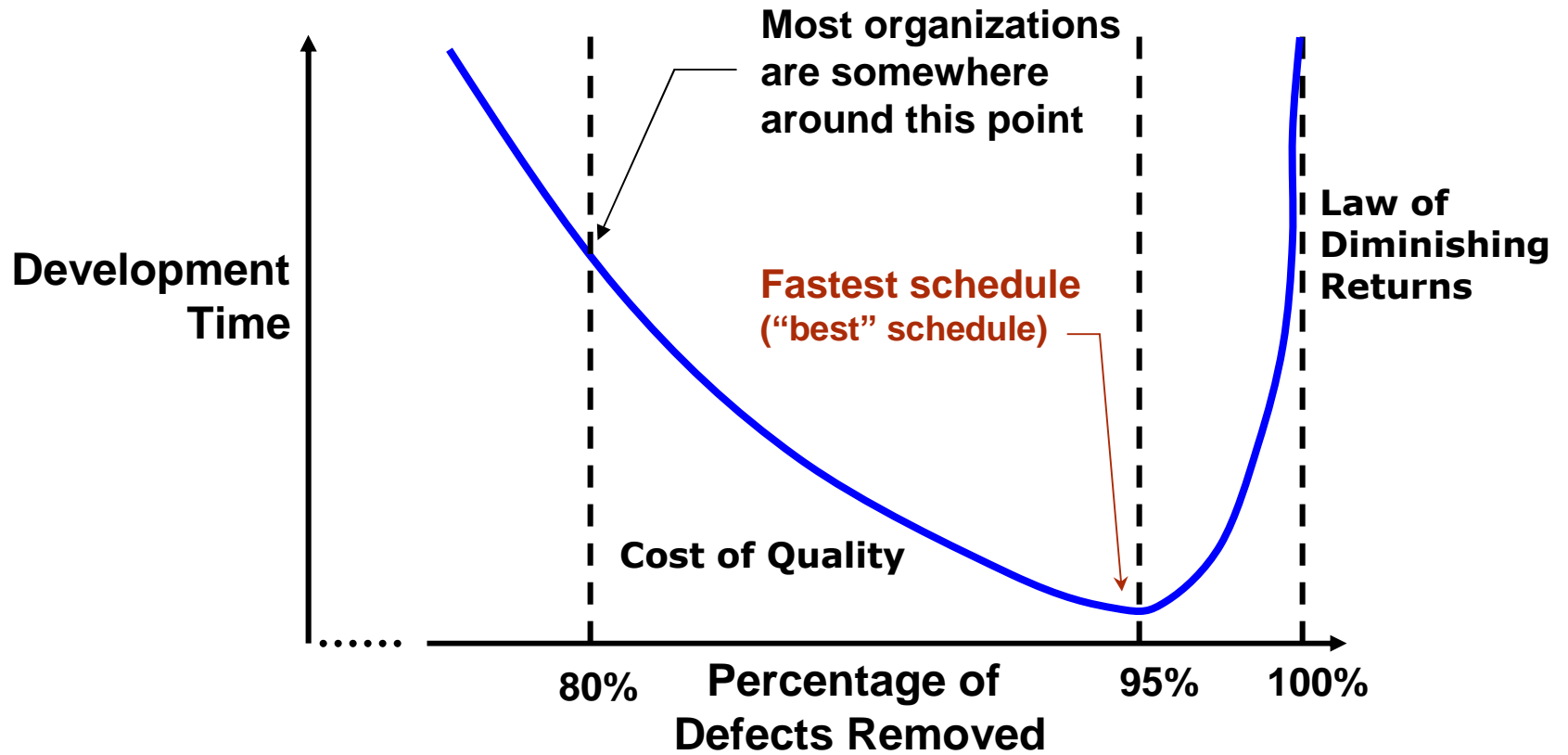


From The Software Project Survival Guide, Steve McConnell.

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Law of Diminishing Returns



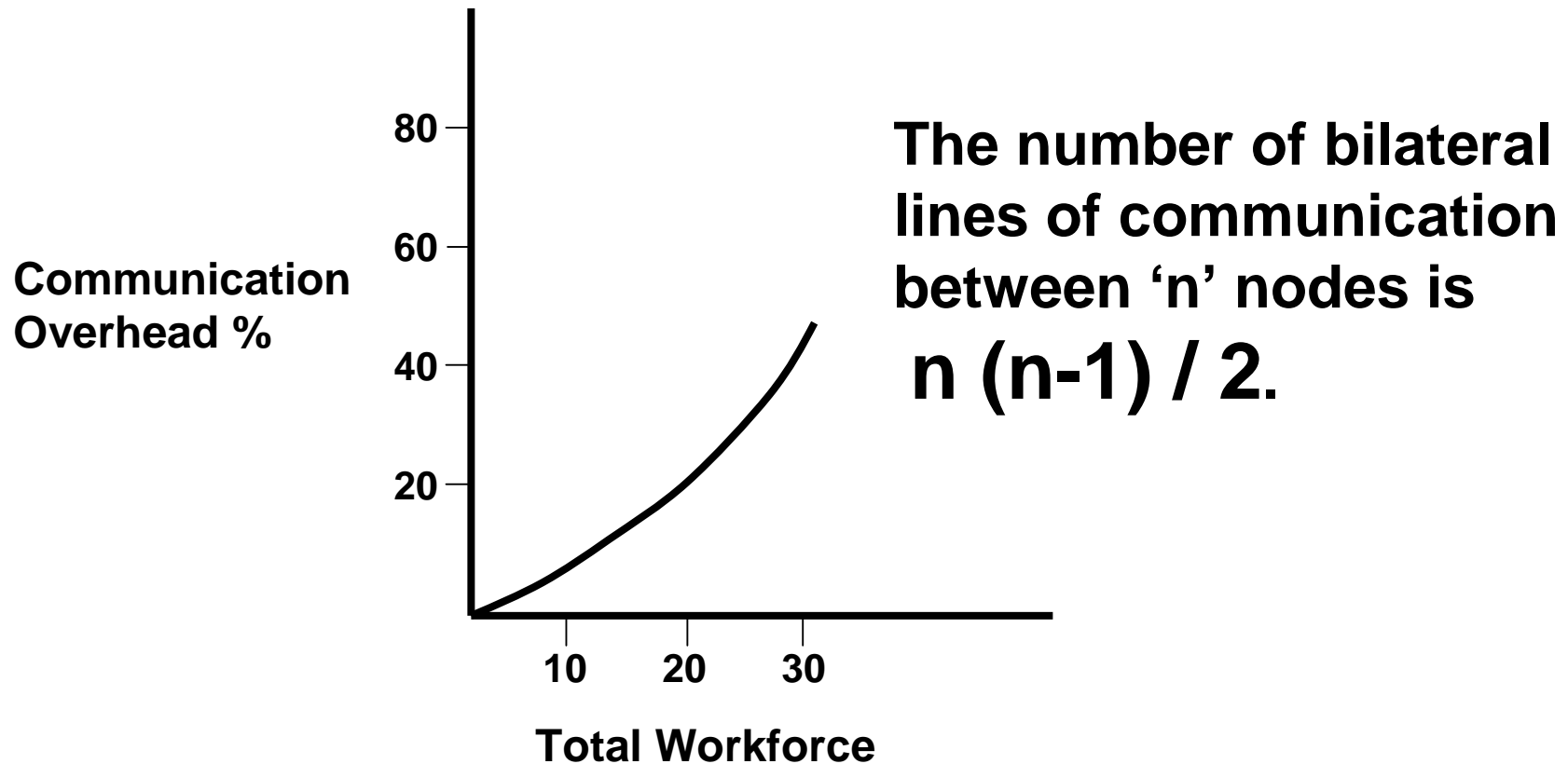
From The Software Project Survival Guide, Steve McConnell.

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Quality in Communications

Software Project Dynamics: An Integrated Approach by Abdel-Hamid and Madnick

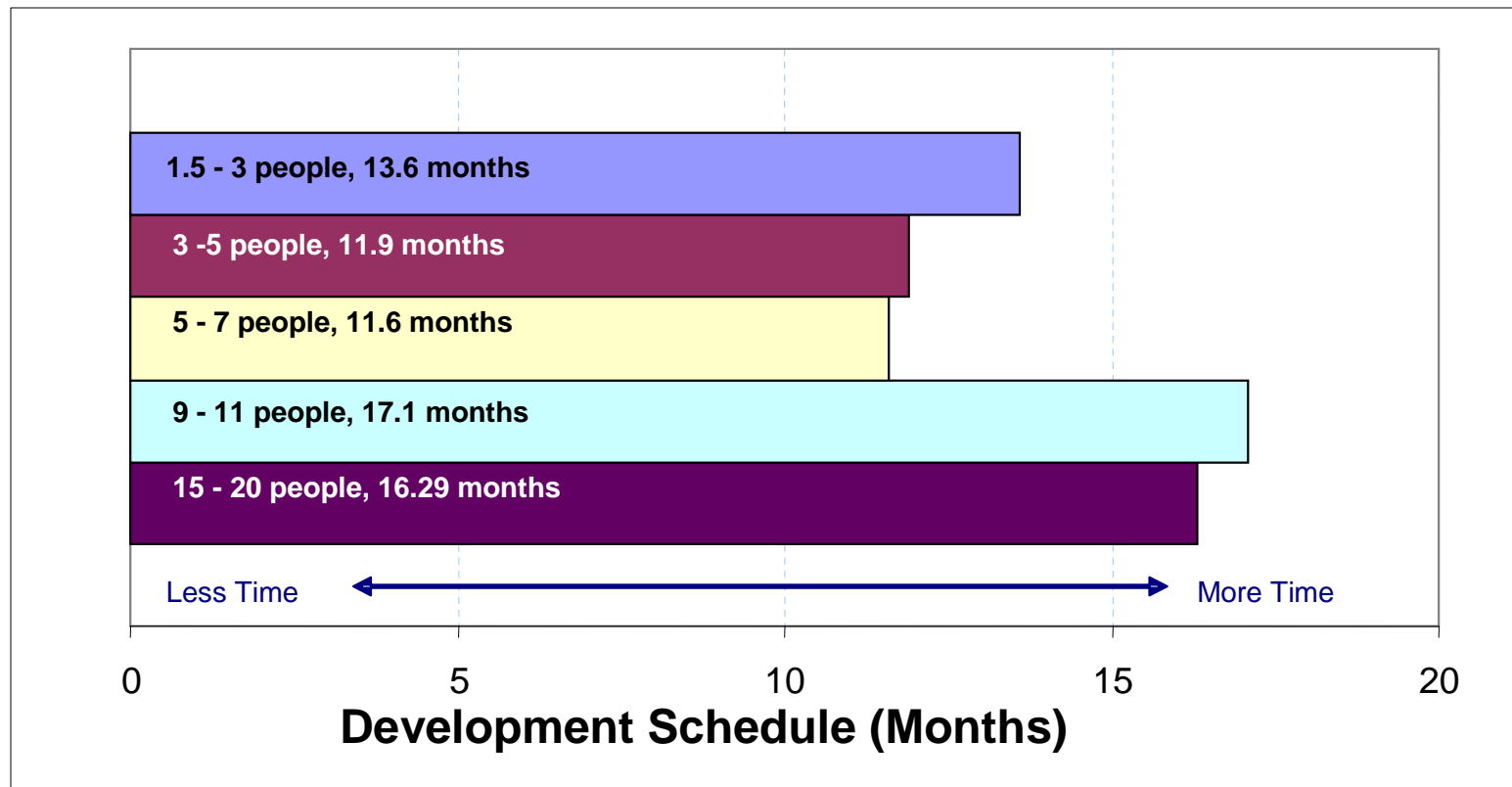


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Average Schedule Months

(for approximately 60,000 Equivalent Source Lines of Code)



“Familiar Metric Management- Small is Beautiful-Once Again”

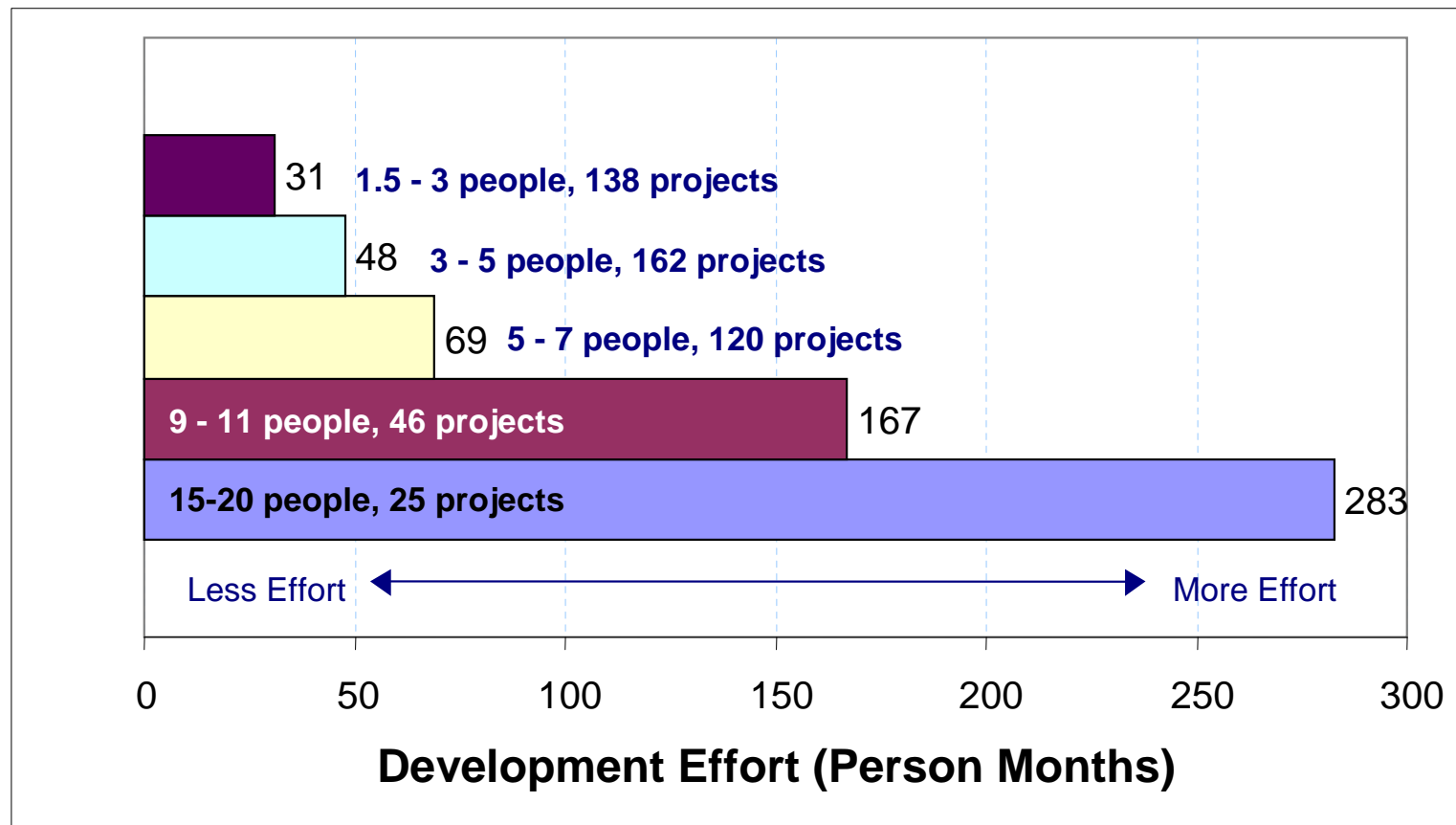
by Lawrence Putnam and Ware Myers

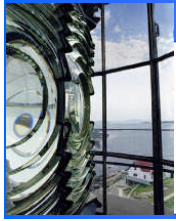


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Development Effort





Defect Drivers

- **People**
- **Time Pressure**
- **Process Maturity**
- **Size**
- **Organizational Complexity**
- **System Complexity**
- **Poor Tools**

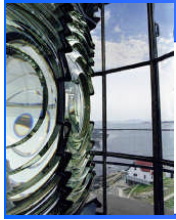




QA in Practice

- **Develop a Quality Driven Development Methodology™**
- **Measuring processes**
- **Policies mandating use of processes**
- **Independent QA**
- **Senior management oversight**





Fundamental Measures for Software

- **Function points contracted versus function points delivered (complete)**
- **Cost per function point (value)**
- **Function points per calendar month (capacity)**
- **Defects per function point (quality)**





WBS for QA

- **Activities to test and train people**
- **Activities to measure, validate and manage critical path**
- **Activities to identify and to ensure compliance with documented processes**
- **Review of appropriateness of size**
- **Review of appropriateness of organization, including independent QA**
- **Report on cyclomatic complexity**
- **Review of appropriateness of tools**
- **Reviews by senior management**





Quality Control Principles

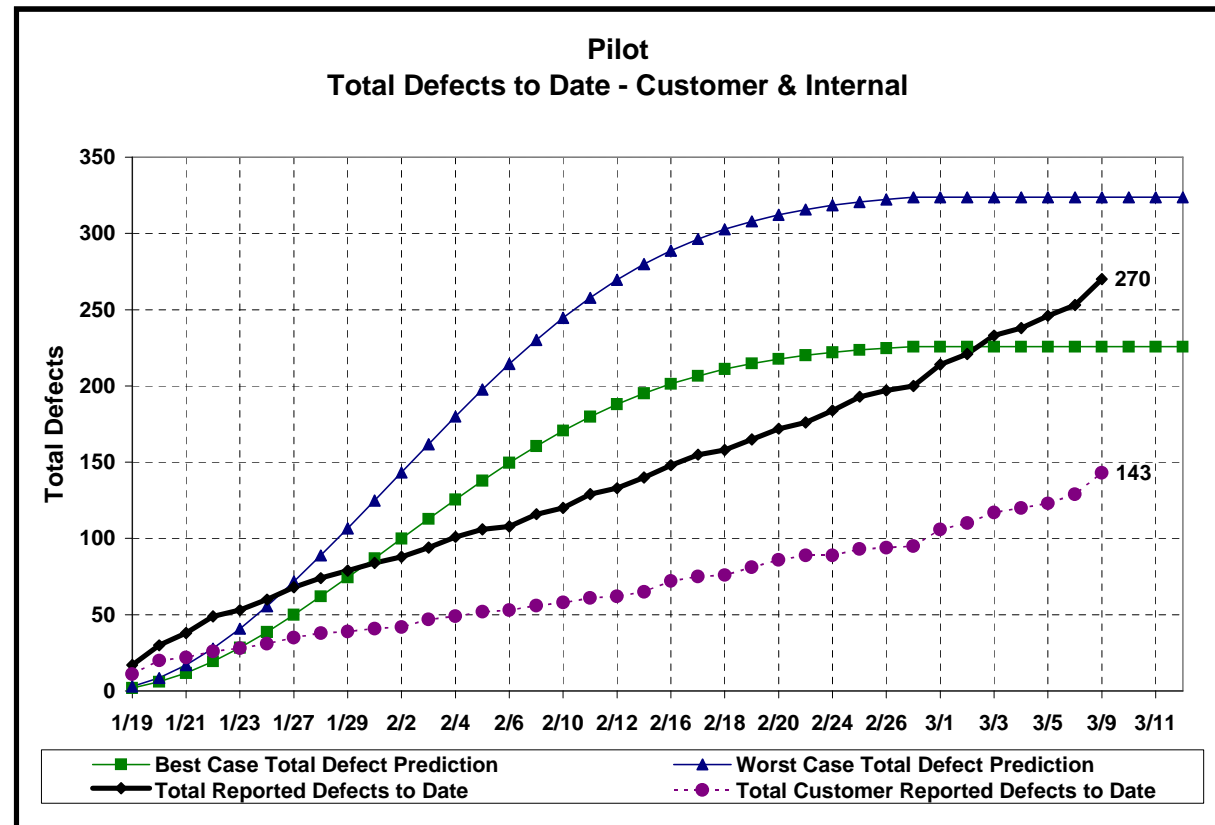
- **Defects are found based on the number of defects in the system and the unique effort to find them**
- **Systems with more function points have a likelihood of higher fault densities (number of defects per function point)**
- **Defects should be estimated, tracked and controlled to a baseline**





Predicted versus Found Defects

- Measures release readiness
- Requires defect tracking and defect prediction data
- Exit criteria low and high thresholds
- Total defects found and slope create exit criteria





QC in Practice

- **Estimating defects in work products**
- **Planning to ensure finding defects**
- **Tracking actual defects found in work products versus plans**
- **Taking control actions when actual results are out of acceptable bounds**



WBS for QC

- **Estimation of defects in addition to effort, cost, size and schedule for each work product**
- **Activities to find defects in all work products**
- **Activities for measuring, tracking and controlling defects**



Earned Value Terms for Quality

Acronym

Term

PQTM

Planned Quality

AQTM

Actual Quality

EQTM

Earned Quality

QVTM

Quality Variance

QPITM

Quality Performance Index

DACTM

Defects At Completion

DTCTM

Defects To Complete





Summary

- **Good QA and QC principles must be captured in plans**
- **Processes must be measured**
- **Defects must be measured and controlled by work product**

