The Economics of Software Performance Engineering

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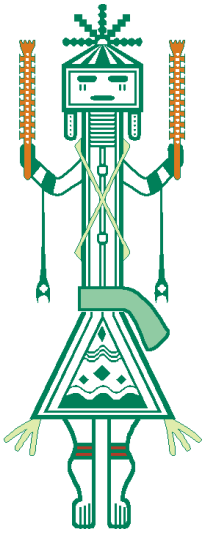
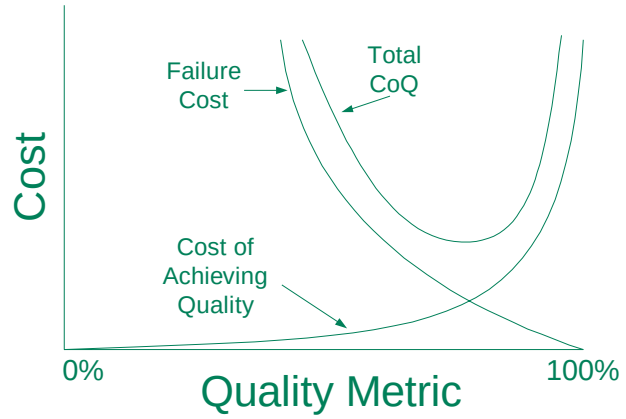
Objectives



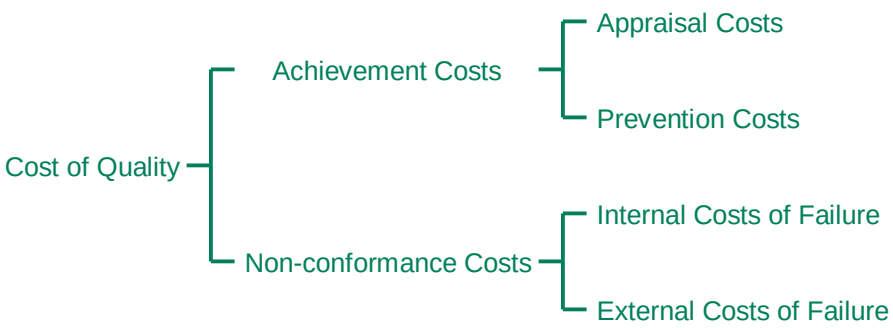
- To present ways of quantifying the costs and benefits of SPE
- To present some real-life case studies
- To elicit additional case studies from the audience.

Cost of Quality



- Based on the work of Juran
- Extended to software by Krasner and others
  - Applied primarily to defect removal due to process improvement

Cost of Quality Categories



Achievement Costs—Examples

- Appraisal Costs—costs of assessing software quality
  - Performance design reviews
  - Performance testing
  - SPE V&V
- Prevention Costs—costs of ensuring software quality
  - PE salaries
  - Tools
  - Performance-oriented design
  - Performance walkthroughs

- Some costs may be part achievement and part appraisal—e.g., performance measurement tools
  - If you are measuring to determine whether the software meets its performance objectives, you're doing an appraisal
  - If you are measuring to gather data for constructing performance models, you're doing prevention

Non-conformance Costs—Examples

- Internal Costs of Failure—occur *before* the software is released/delivered
  - Performance tuning
  - Redesign
- External Costs of Failure—occur *after* the software is released/delivered
  - Returned product
  - Upgrades
  - Contractual penalties

Controversial Costs

- Beware of including controversial costs
  - Opportunity costs
  - Cost of delays
- Difficult to quantify
- May be mistaken for “padding” totals for dramatic effect
- Contention can sabotage the entire cost-accounting effort

The "Dark Side" of CoQ

- Cost of Quality calculations may lead you to underestimate non-conformance costs by not including costs to customers
  - Lost productivity due to poor performance
  - Cost of replacing software
  - Lost data
  - Etc.
- These costs can be shifted back to the seller via litigation

Example—Ford Pinto

- Costs and benefits related to fuel leakage
- Costs
  - 11 million cars, 1.5 million light trucks
  - Unit cost: $11 per car; $11 per truck
  - Total costs: $137 million
- Benefits
  - Savings: 180 burn deaths, 180 injuries, 2100 vehicles
  - Unit cost: $200,000 per death, $67,000 per injury, $700 per vehicle
  - Total cost: $49.5 million
- Problem: lawsuit costs were much higher

C. Kaner, "Quality Cost Analysis: Benefits and Risks," *Software QA*, vol. 3, no.1, p. 23, 1996.

Sample Chart of Accounts

- 1 Appraisal Costs
  - 1.1 Project Appraisal Costs
    - 1.1.1 Performance lab hardware and space
    - 1.1.2 Performance testing: planning, test data generation, test execution, reporting, evaluation

Adapted from: D. Houston and J. B. Keats, “Cost of Software Quality: A Means of Promoting Software Process Improvement,” Un-Published Report, Arizona State University, 1996.

- 2 Prevention Costs
  - 2.1 Requirements
    - 2.1.1 Establishment of performance objectives
  - 2.2 Project Prevention Costs
    - 2.2.1 Performance walkthrough
    - 2.2.2 Developer SPE training
    - 2.2.3 Performance-oriented design
    - 2.2.4 Performance modeling
    - 2.2.5 Model V&V
  - 2.3 SPE Administration
    - 2.3.1 PE salaries
    - 2.3.2 SPE process and standards definition and publication
    - 2.3.3 PE training
    - 2.3.4 Tools

3 Internal Failure Costs
- 3.1 Architecture/design defect costs
  - 3.1.1 Problem identification and reporting
  - 3.1.2 Architecture/design correction
  - 3.1.3 Additional testing due to correction
  - 3.1.4 Wasted components due to architecture/design changes
- 3.2 Tuning costs
  - 3.2.1 Problem identification and reporting
  - 3.2.2 Rework of tuned components
  - 3.2.3 Additional testing due to correction

4 External Failure Costs
- 4.1 Technical support costs
- 4.2 Returned products
- 4.3 Cost of maintenance releases
- 4.4 Penalties
- 4.5 Liability claims
- 4.6 Costs to maintain customer/user goodwill (from sales reports)
- 4.7 Lost sales (from salesperson reports)

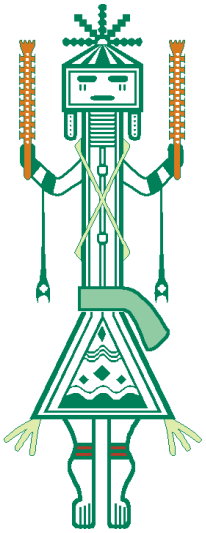
Convincing Management

- Management under financial pressure
  - Shrinking budgets
  - High fiscal accountability
  - Need quantitative information
- Most useful metrics
  - Quality costs as a percent of sales and profit
  - Quality costs as a percent of total development costs
  - Quality costs compared to the magnitude of the current problem

Making it Happen

- Strategic approach—track quality-related costs organization-wide on an on-going basis
  - Valuable management tool
  - Difficult to initiate, achieve buy-in
- Tactical approach—one project/product at a time
  - More manageable initially
  - Demonstrate success to convince management
- Practical considerations
  - Don't try to do too much too fast
  - Don't worry about measuring all of the costs

Summary



- Introduction to SPE economics
- Case studies
- Future?