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

Cost of Quality

Achievement Costs

Appraisal Costs
Prevention Costs

Non-conformance Costs
Internal Costs of Failure
External Costs of Failure
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

### 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


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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?

Questions?