Software Quality Cost

Kualitas Perangkat Lunak

Institut Teknologi Del

21/22

Objectives

- Explain the objectives of costs of software quality measurements.
- Compare the classic model to the extended model.

Why calculate the cost? What for?

- To *control the costs* associated with error prevention and detection of errors
- To *evaluate economic damages of software failures* and prevention and appraisal costs as a basis for revising and updating the SQA budget
- To *facilitate economic evaluation* of planned increase or decrease SQA activities or investment in new or updated SQA infrastructure, based on past economic performance

Cost of Software Quality

- Economic assessment of software quality development and maintenance
- Classic Model: the general costs of quality model to the software industry
  - Derived from the common industry quality model
- Extended Model: an alternative that more effectively captures features specific to the software industry

Classic Model of Software Quality Cost

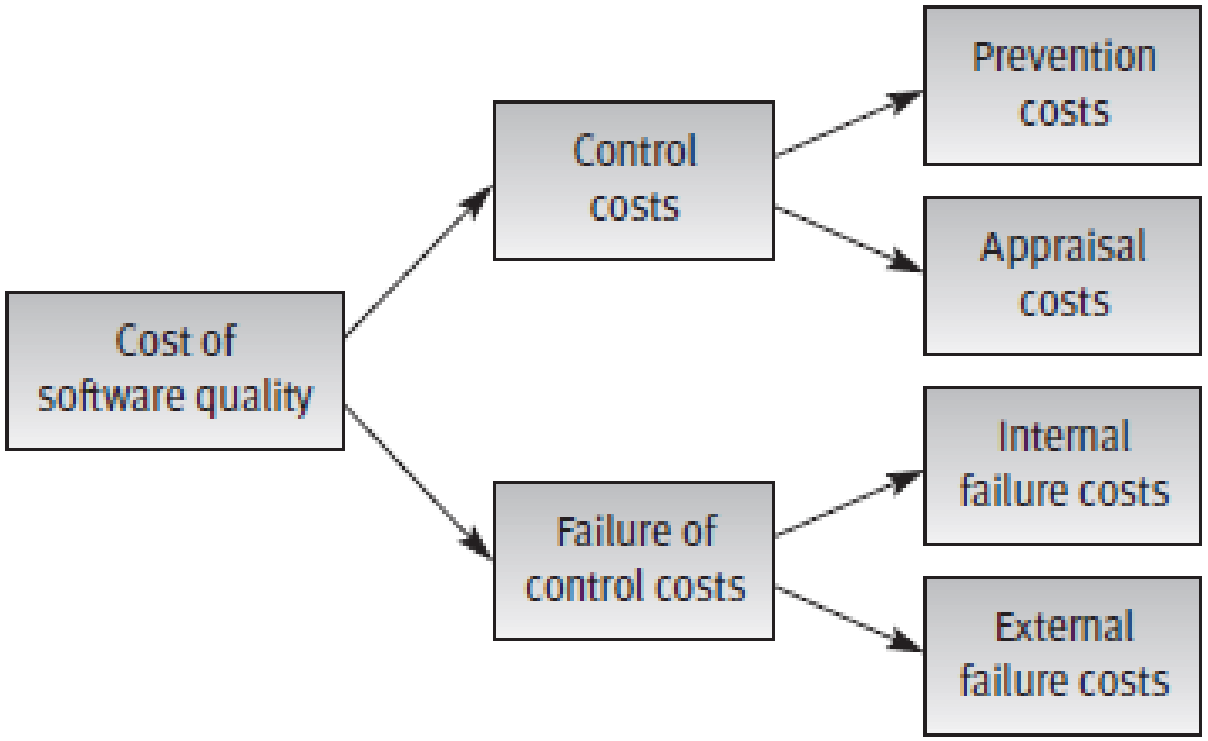

Figure 22.1: The classic model of cost of software quality

Cost of Control

- Costs of control include *costs that are spent to prevent and detect software errors* in order to reduce them to an accepted level.

  Prevention Costs:

  ➔ include investments in quality infrastructure and quality activities that are not directed to a specific project or system, being general to the organization.

  Appraisal Costs

  ➔ include the costs of activities performed for a specific project or software system for the purpose of detecting software errors

Cost of Failure

- Costs of failure include costs that occurred *because of failure to prevent and detect software errors*. The model further subdivides these into subclasses:
  - **Internal failure costs:** include costs of correcting errors that have been detected by design reviews, software tests and acceptance tests (carried out by the customer) and **completed before the software is installed at customer sites**.
  - **External failure costs:** include all costs of correcting failures **detected by customers** or the maintenance team **after the software system has been installed**.

Preventive Cost

- Investments in development of new or improved SQA infrastructure components or, alternatively, regular updating of those components
  - Procedures, work instructions
  - Support devices: templates, checklist
  - SCM
  - Software Quality Metrics
- Regular implementation of SQA preventive activities
  - Certification, Instructions for new employees
- Control of the SQA system
  - Quality Reviews
  - Quality Audits by customer

Appraisal Cost

- Covers:

1. Reviews (FDR, peer reviews, expert reviews)
2. Software Testing (unit test,integration test, UAT)
3. Assuring quality which conducted involving external participants (subcontractors, supplier of COTS, customer)

Internal Failure Costs

- Costs to correct errors during software development (before installed on customer's site)
- Includes:
  - Costs of redesign after review design and test findings
  - Costs of re-programming or correcting programs in response to test findings
  - Costs of repeated design review and re-testing (regression tests).

External Failure Costs

- Costs of correcting failures detected by customers or maintenance teams after the software system has been installed at customer sites
- Includes:
  - Resolution of customer complaints during the warranty period
  - Correction of software bugs detected during regular operation
  - Correction of software failures after the warranty period is over even if the correction is not covered by the warranty

External Failure Costs

- Includes:
  - Damages paid to customers in case of a severe software failure detected during regular operation
  - Reimbursement of customer's purchase costs
  - Insurance against customer's claims in case of severe software failure

Table 22.1: Cost items and cost of quality subclasses (example)

Cost item	Cost of quality subclass
Head of SQA Unit (personnel costs)	50% prevention costs, 50% internal failure costs
SQA team member reviewing compliance with instructions (personnel costs)	Prevention costs
Other team SQA members (personnel costs)	Prevention and appraisal costs according to monthly personnel records
Development and maintenance team participation in internal and external SQA audits (personnel costs)	Prevention costs – recorded time spent on audits
Testing team – first series of tests (personnel costs)	Appraisal costs – recorded time spent
Testing team – regression tests (personnel costs)	Internal failure costs – recorded time spent
Development and maintenance team correction of errors identified by the testing team (personnel costs)	Internal failure costs – recorded time spent
Maintenance team correction of software failures identified by the customer (personnel costs + traveling costs to the customer's site)	External failure costs – recorded time spent
Regular visits of unit's SQA consultant (standard monthly fee)	Prevention costs
Unit's SQA consultant's participation in external failure inquiries (special invoices)	External failure costs
SQA journals, seminars, etc.	Prevention costs

Extended Model of Software Quality Cost

- Extends the classic model to include management's "contributions" to the total cost of software quality. Consists of these two subclasses:
  - Managerial Preparation and control costs
  - Managerial Failure Costs

Extended Model of Software Quality Cost

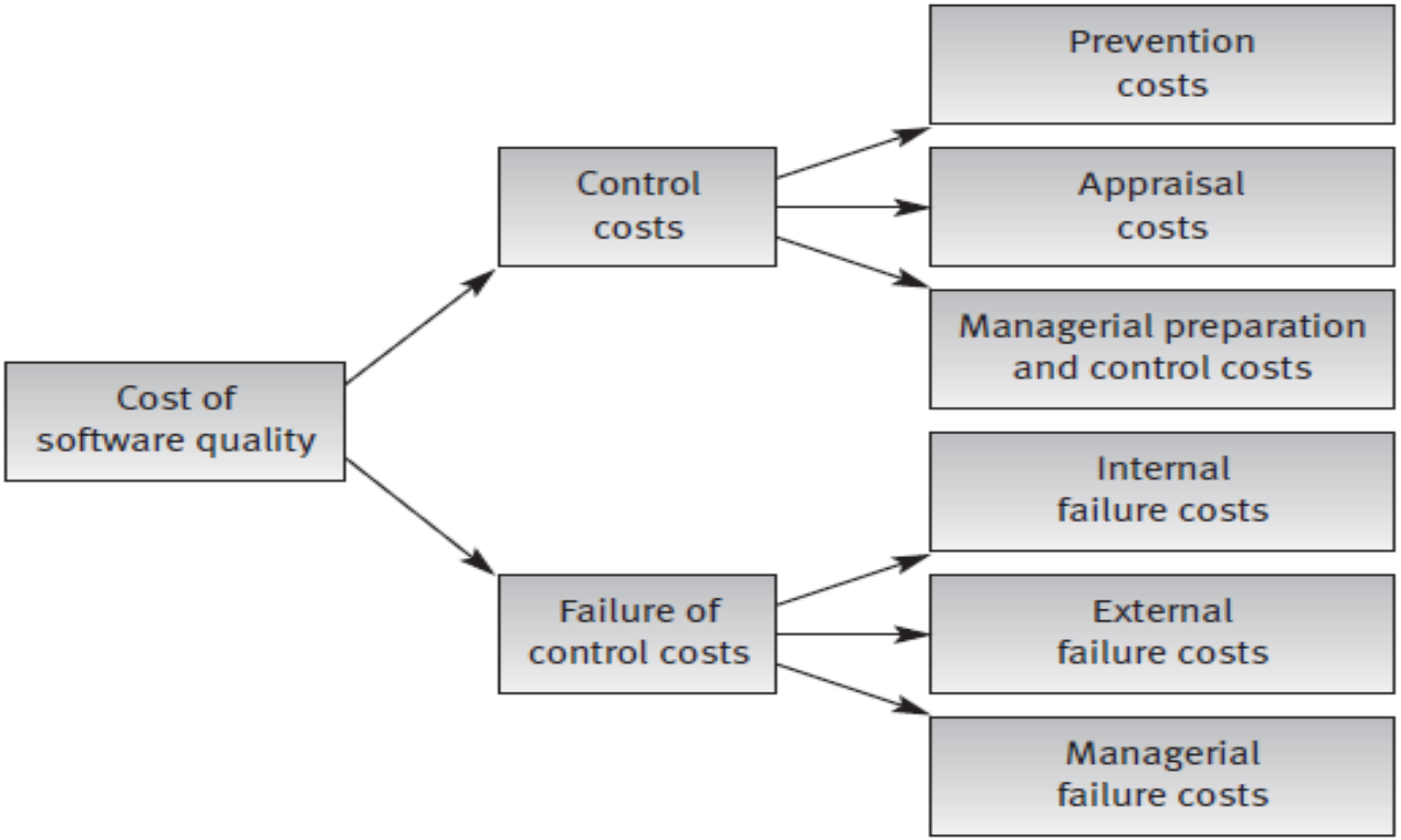

Figure 22.2: The extended cost of software quality model

Managerial preparation and control costs

- Associated with activities performed to prevent managerial failures or reduce prospects of their occurrence. Which includes:
  - Costs of carrying out contract reviews
  - Costs of preparing project plans, including quality plans and their review
  - Costs of periodic updating of project and quality plans
  - Costs of performing regular progress control of internal software developmentefforts
  - Costs of performing regular progress control of external participants' contributions to the project

Managerial Failure Costs

- Managerial Failure costs can happened throughout the entire phase in software development.
  - Usually caused by failed attempts to estimate the appropriate project schedule and budget
- Typical Managerial Failure costs include:
  - Unplanned costs for professional and other resources
  - Damages paid to customers as compensation as late project completion (a result of unrealistic schedule, or result management failure to manage team members)
  - Domino effect

Q

- Apakah *software quality cost* yang tinggi menjamin mutu yang baik dari *software*?

References

- Galin, Daniel. Software Quality Assurance. *From theory to implementation.* Software Quality Cost*,* Chapter 22.