Software Quality Assurance

Modified from Roger S. Pressman, Software Engineering:

A Practitioner's Approach 8th Edition, McGraw Hill, 2014

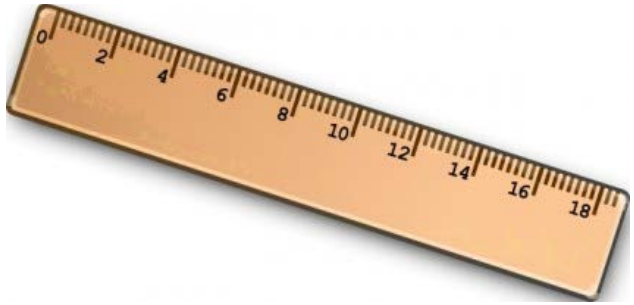
What is SQA?

- SQA includes
  - a quality management approach
  - effective software engineering methodology (methods and tools)
  - formal technical reviews
  - a multitiered testing strategy
  - control of software documentation and changes made to it
  - a procedure to assure compliance with software development standards
  - measurement and reporting mechanisms

QA → ล้อมคอกก่อนวัวหายไป

Quality Concepts

- For hardware and manufactured product, we have to control differences between variation
- For software, we need to
  - minimize the difference between the predicted and actual resources
  - make sure that testing covers a known percentage of the software from one release to another
  - ensure that the variance in the number of bugs is minimized from one release to another



Quality Concept (cont.)

โดยทั่วไปคำว่า Quality

- Quality is “a characteristic or attribute of something”
- we talk about measurable characteristics: things we are able to compare to known standards such length, color
- 2 kinds of qualities based on measurable characteristics are quality of design and quality of conformance
- quality of design:
  - refers to the characteristics that designers specify for an item
  - grade of materials, tolerances, and performance to specs
- quality of conformance is the degree to which the design specifications are followed during manufacturing

Quality Concepts (cont.)

- Quality control is the series of inspections, reviews, and tests
- Quality control includes a feedback loop to the process that created the work product
- quality assurance: analysis, auditing and reporting activities
- cost of quality
  - prevention costs: quality planning, test equipment, training
  - appraisal costs: reviews or inspections, equipment calibration and maintenance, testing
  - failure costs: internal costs (rework, repair), external costs (compliant resolution, product return and replacement, help line support, warranty work)

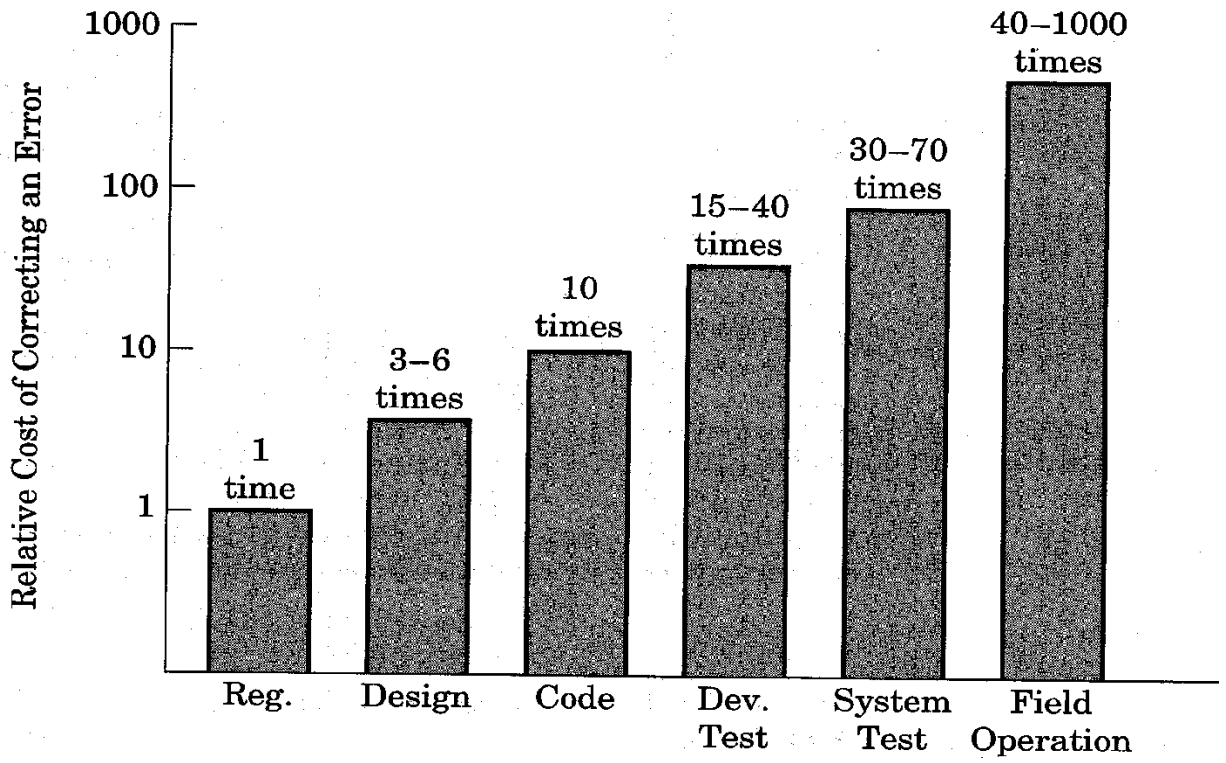
Quality Control vs. Quality Assurance?

QC เน้นการตรวจสอบ QA เน้นการวิเคราะห์และรายงานผล

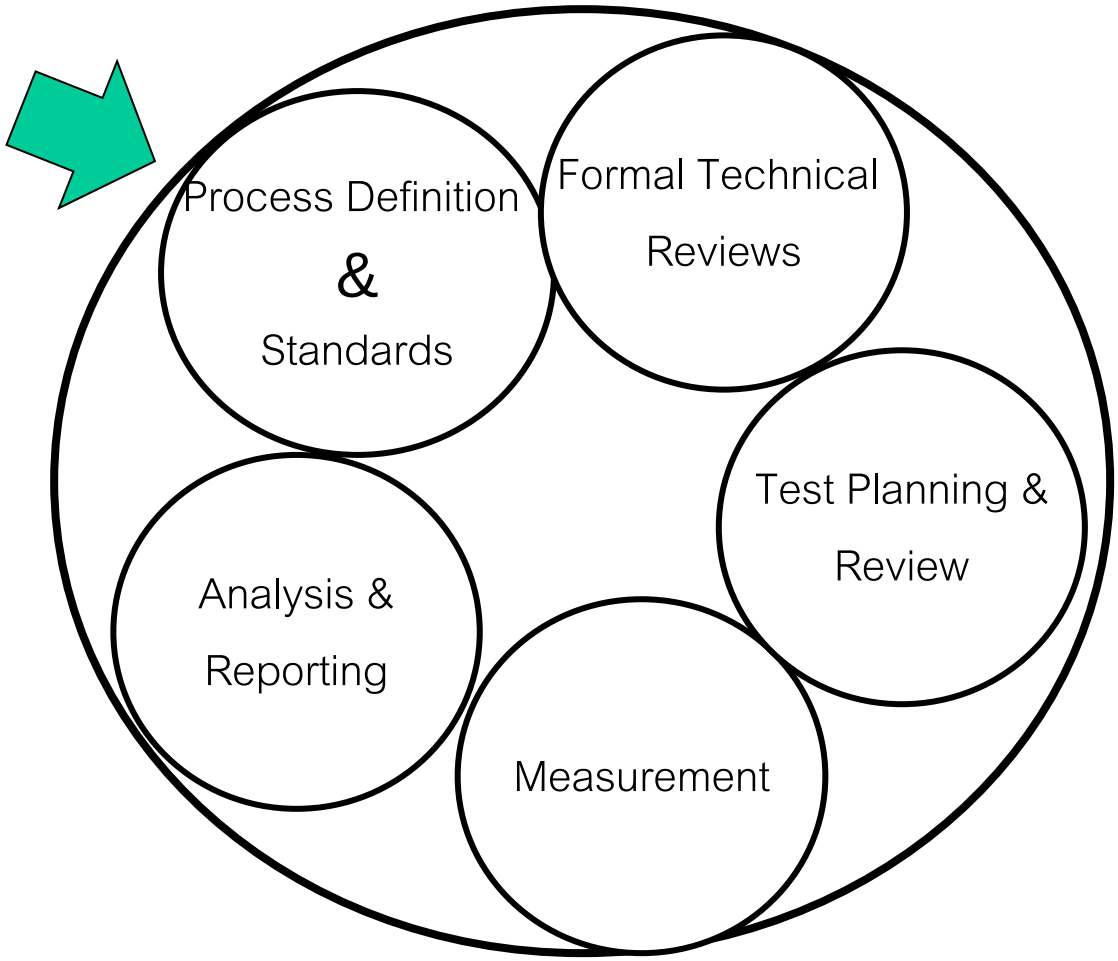
QA vs. QC

- QA aims to prevent defects with a focus on the process used to make the product. It is a proactive quality process.
- QC aims to identify (and correct) defects in the finished product. Quality control, therefore, is a reactive process.

Relative Cost of Correcting an Error



Software Quality Assurance



SQA Activities

- SQA activities involve with 2 group of people
  - **software engineers** apply technical methods and measures, conduct reviews, and perform well-planned software testing
  - **SQA group** assist the software engineering team in achieving a high quality and product

ทำไม SQA group ไม่ขึ้นตรงกับทีม SE ที่ทำงาน?

SQA Group's Activities

- Prepare a SQA Plan for a project. The plan identifies:
  - evaluations to be performed
  - audits and reviews to be performed
  - standards that are applicable to the project
  - procedures for error reporting and tracking
  - documents to be produced
  - amount of feedback provided to software project team

เตรียมแผนการทำ SQA

- Participate in the development of the project's software process description

เข้าร่วมทีมเพื่อตรวจ

SQA Group's Activities (cont.)

- Review software engineering activities to verify compliance with the defined software process
- Audit software work products

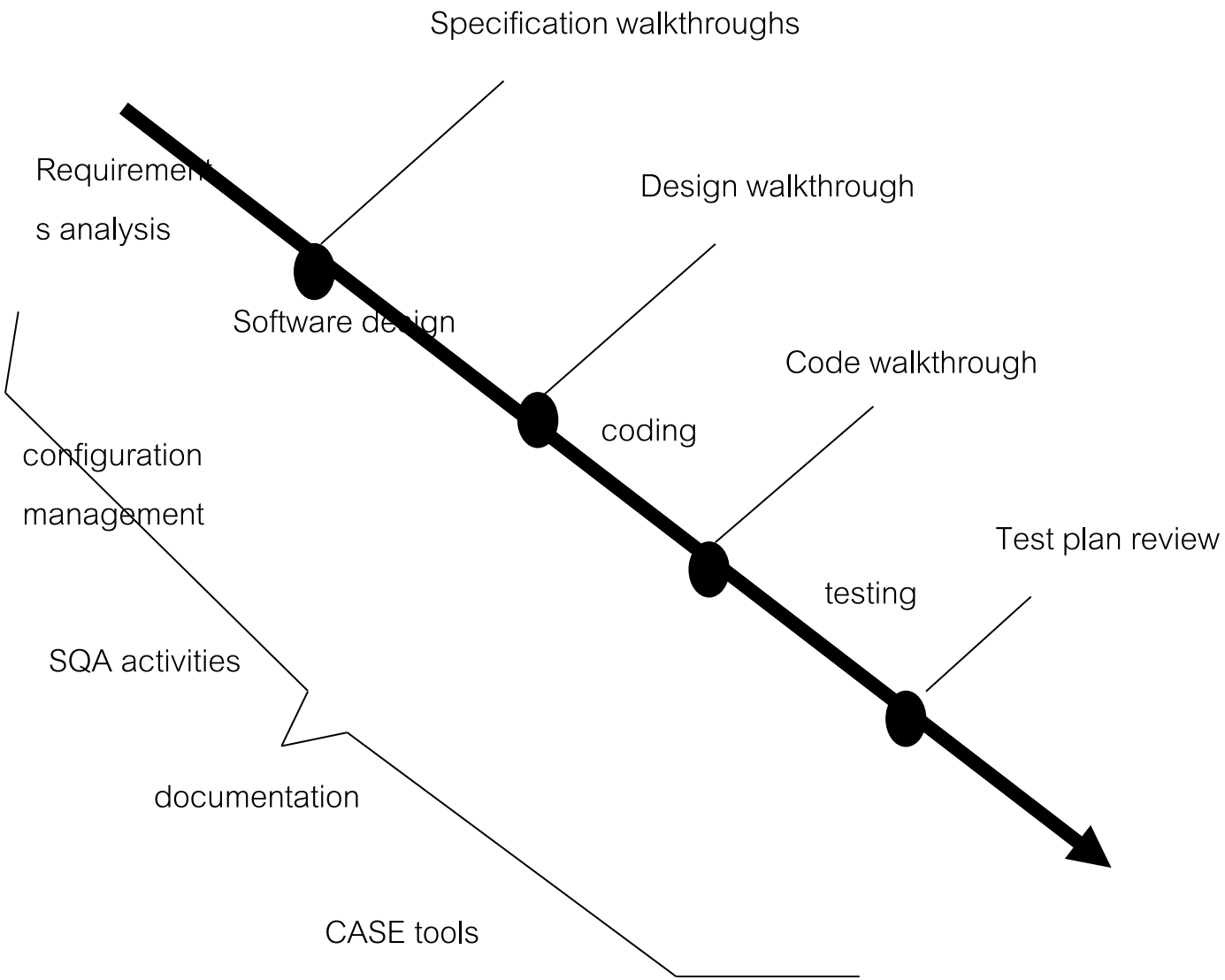
Audit = การตรวจติดตาม

- Ensure that deviations in software work and work products are documented and handle according to a documented procedure
- Record any noncompliance and report to senior management

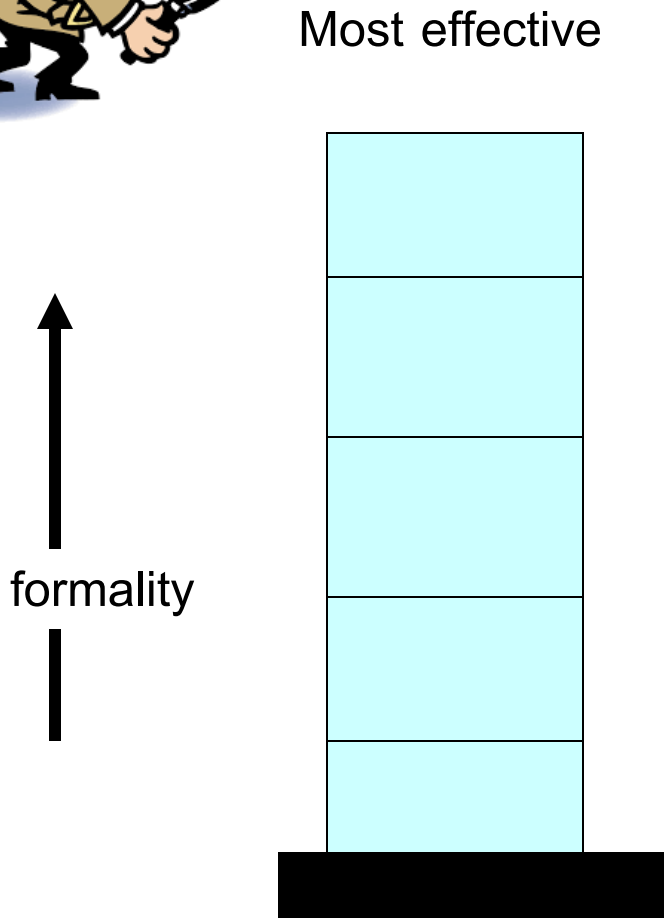
Software Reviews

- Reviews are applied to many points during the development
- Reviews serve to uncover errors
- Objectives are
  - to point out needed improvement in products
  - to confirm those parts of a product if improvement is needed
  - to achieve technical work of more uniform or predictable quality
  - to make technical work more manageable

Ensuring Quality: Reviews



Reviews: An Effectiveness Scale



- Inspection (Formal Technical Review: FTR)
- walkthrough (FTR)
- formal presentation
- informal presentation
- peer group review
- casual conversation

Inspection เป็นทางการมากกว่า มีกำหนดแผนชัดเจน

Development Cost Comparison

TABLE 8.1

DEVELOPMENT COST COMPARISON

Errors Found	Number	Cost Unit	Total
Reviews Conducted			
During design	22	1.5	33
Before test	36	6.5	234
During test	15	15	315
After release	3	67	201
			783
No Reviews Conducted			
Before test	22	6.5	143
During test	82	15	1230
After release	12	67	804
			2177

Review ทำให้พบ Errors ก่อนเนิ่น Cost ถูกกว่า พบทีหลัง

Formal Technical Reviews (FTR)

- Objectives:
  - to uncover errors in function, logic, or implementation for any representation of the software
  - to verify that the software under reviews meets its requirements
  - to ensure that the software has been represented according to predefined standards
  - to achieve software that is developed in a uniform manner
  - to make projects more manageable
- FTR serves to promote back up continuity because number of people become familiar with parts of the software
- FTR is conducted as a meeting report

The Review Meeting

- Review meeting constraints:
  - 3-5 people involved in the review
  - each participant spend at most 2 hours in preparing
  - review meeting should be less than 2 hours
- Review Team:
  - review leader
  - producer
  - reviewer
  - recorder

Reviewer's Preparation

- Be sure that you understand the CONTEXT
- first, skim the all product material to understand location and format of the information
- next, read product material and annotate hardcopy
- pose your written comments as questions
- avoid issues of style
- inform the review leader if you can't prepare

Conducting the Review

- Be prepared - evaluate product before the review
- review the product, not the producer
- keep your tone mild, ask questions instead of making accusations
- stick to the review agenda
- raise issues, don't resolve them
- avoid discussions of style - stick to technical corrections
- schedule reviews as project tasks
- record and report all review reuse

Review Reporting and Recording Keeping

- Review summary report answers three questions:
  - What was reviewed?
  - Who reviewed it?
  - What were the findings and conclusions?

Review Guidelines

- Review the product, not the producer.
- Set an agenda and maintain it.
- Limit debate and rebuttal.
- Enunciate problem areas, but don't attempt to solve every problem noted.
- Take written notes.

Review Guidelines

- Limit the number of participants and insist upon advance preparation.
- Develop a checklist for each work product that is likely to be reviewed.
- Allocate resources and time schedule for FTRs.
- Conduct meaningful training for all reviewers.
- Review your early reviews.

Metrics Derived from Reviews

- inspection time per page of documentation
- inspection time per KLOC or FP
- inspection effort per KLOC or FP
- errors uncovered per reviewer hour
- errors uncovered per preparation hour
- errors uncovered per software engineering task
- number of minor errors
- number of major errors
- number of errors found during preparation

The SQA Plan [IEEE std 730-1984]

- Initial section:
  - describes purpose and scope of the document
  - indicate software process covered by quality assurance
- Reference section: list all documents, all application standards
- Management section:
  - describe SQA' s place in the organizational structure
  - SQA tasks and activities
  - roles and responsibilities relative to product quality

The SQA Plan [IEEE std 730-1984] (cont.)

- Document section:
  - describes works product produced: project plans, models, technical document, user documents
  - defines minimum set of work products
- Standards, Practices, and Conventions
  - list all applicable standards
  - list all metrics to be collected
- Reviews and Audits section: identify the reviews and audits to be conducted

The SQA Plan [IEEE std 730-1984] (cont.)

- Test section
  - refer to the software test plan
  - define test record-keeping
- Problem reporting and corrective section:
  - defines procedures for reporting, tracking, and resolving errors and defects
  - identifies responsibilities for these activities

ISO 9000 Quality Standard

- contains 20 requirements
- is applicable to all engineering discipline
- a special set of ISO guideline (ISO 9000-3) interpret for use in software process