Software Quality Engineering

Static Testing

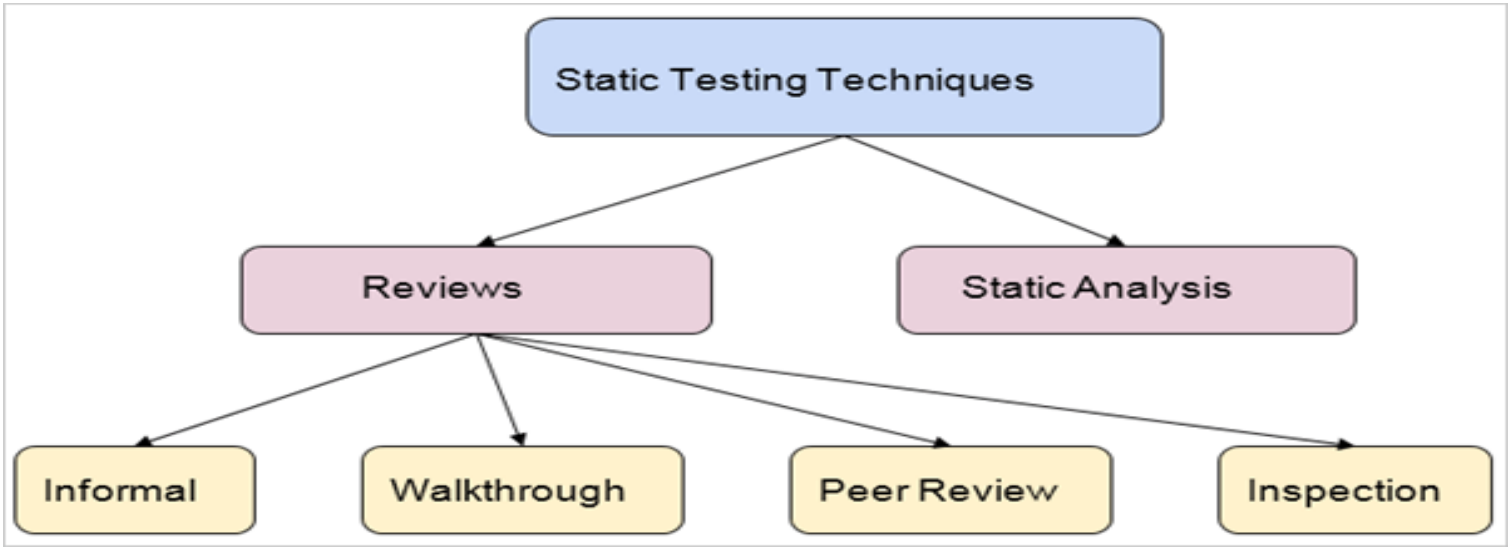
Software Myth

(Developer Perspectives)

Until the software is coded and is available for testing, there is no way for assessing its quality.

Usually, there are too many tiny bugs inserted at every stage that grow in size and complexity as they progress thru further stages!

Ripple Effect Without ……..



- **Manual examinations:** Analysis of code done manually ……**REVIEWS.**

- **Automated analysis using tools:** Static analysis which is done using tools.

Reviews / Static Testing

What Are Reviews?

- A meeting conducted **by technical people** for **technical people**.
- Technical assessment.
- Verification process
- Cost-effective process.
- Quality assurance mechanism
- A training ground

What Reviews Are Not?

- A project summary or progress assessment.
- A meeting intended solely to impart information.
- A mechanism for political or personal reprisal!

What Gets Reviewed ?

- Any software artifact (deliverable)
- Anything that can be created and described
- A deliverable that is particularly complex
- Deliverables that need to be taught to someone else
- Any Artifact

Participants :

- **Moderator**: Performs entry check, follow up on rework, coaching team member, schedule the meeting.
- **Author**: Takes responsibility for fixing the defect found and improves the quality of the document
- **Scribe**: It does the logging of the defect during a review and attends the review meeting
- **Reviewer**: Check material for defects and inspects
- **Manager**: Decide on the execution of reviews and ensures the review process objectives are met.

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 correctness
- Schedule reviews as project tasks
- Record and report all review results


Informal
1
2
Walkthrough
Review
Inspection
4
3
Peer review

- **Informal reviews:** document designer place the contents in front of viewers, and everyone gives their view.

- **Walkthrough:** is used to performed by a skilled person or expert to verify the bugs.

- **Peer review:** can check one another's documents to find and resolve the bugs, which is generally done in a team.

- **Inspection:** verifying the document by the higher authority

Review Options Matrix

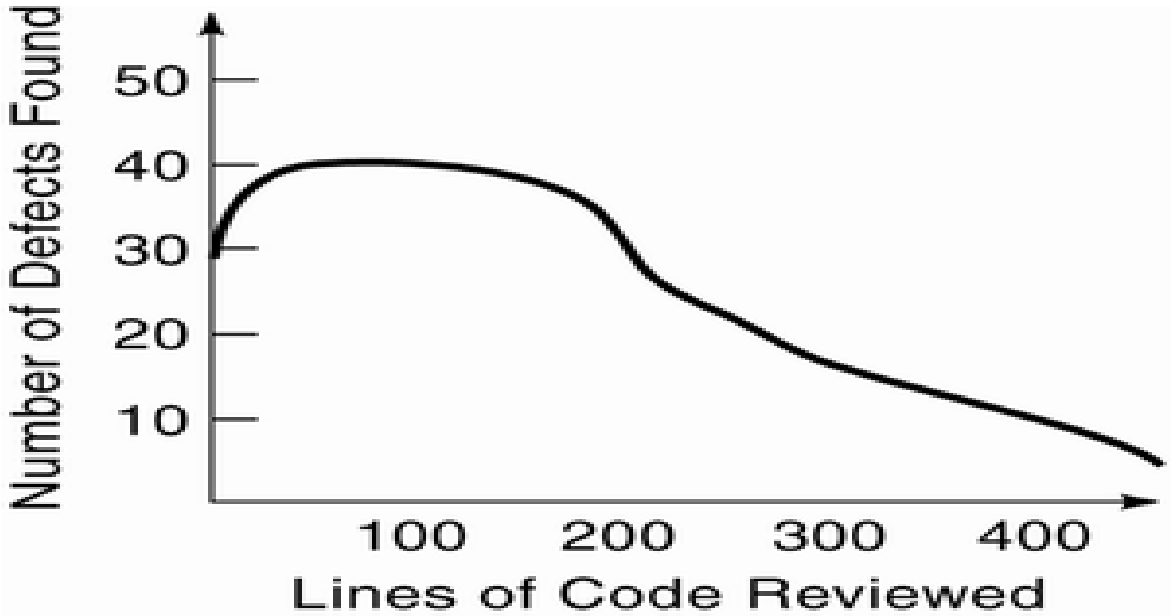
	IPR *	WT	IN	RRR
trained leader	no	yes	yes	yes
agenda established	maybe	yes	yes	yes
reviewers prepare in advance	maybe	yes	yes	yes
producer presents product	maybe	yes	no	no
"reader" presents product	no	no	yes	no
recorder takes notes	maybe	yes	yes	yes
checklists used to find errors	no	no	yes	no
errors categorized as found	no	no	yes	no
issues list created	no	yes	yes	yes
team must sign-off on result	no	yes	yes	maybe

***IPR—informal peer review**
IN—Inspection
WT—Walkthrough
RRR—round robin review

Review Size

- Studies show that about 150 lines of code is the right amount to take to a review .

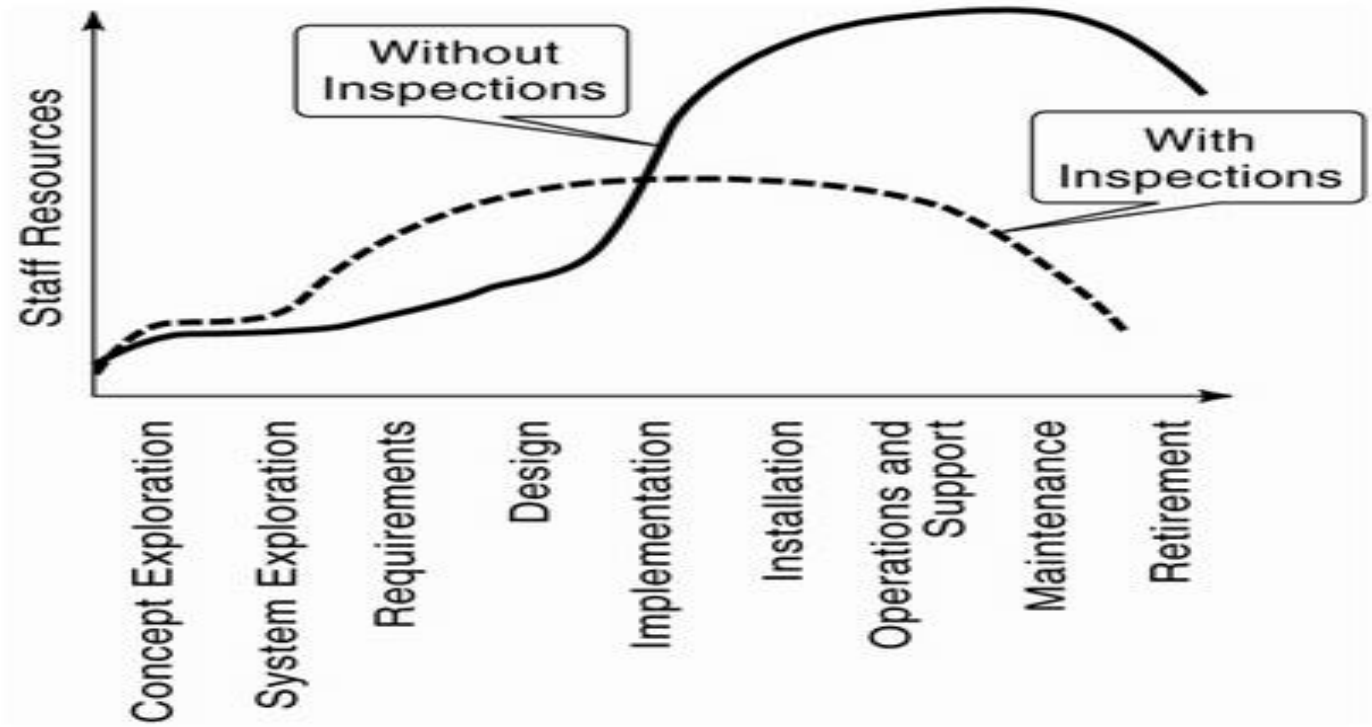
- Raytheon studied historical data to find that the ideal preparation and review rates for design inspections were less than 250 source lines of code (SLOC) per hour, and the ideal review rate for code inspections was less than 300 SLOC per hour.


Number of Defects Found
50
40
30
20
10
100
200
300
400
Lines of Code Reviewed

Review Cost?

- When money and time are spent up front on reviews and repairs, many times the investment will be saved later, in testing, maintenance, and customer support

Figure 23-2. Reviews Result in Less Effort



Return on Investment

- The return on investment for software inspections is defined as:

  Savings/Cost

  Where:

Savings = (Major Defects x 9) + Minor Defects

Cost = (Minutes of Preparation Effort + (Minutes of Conduct Time x 4))/60

Sample-Driven Reviews (SDRs)

- SDRs attempt to quantify those work products that are primary targets for full FTRs.

To accomplish this …

- Inspect a fraction a_i of each software work product, *i.* Record the number of faults, f_i found within a_i.
- Develop a gross estimate of the number of faults within work product *i* by multiplying f_i by $1/a_i$.
- Sort the work products in descending order according to the gross estimate of the number of faults in each.
- Focus available review resources on those work products that have the highest estimated number of faults.

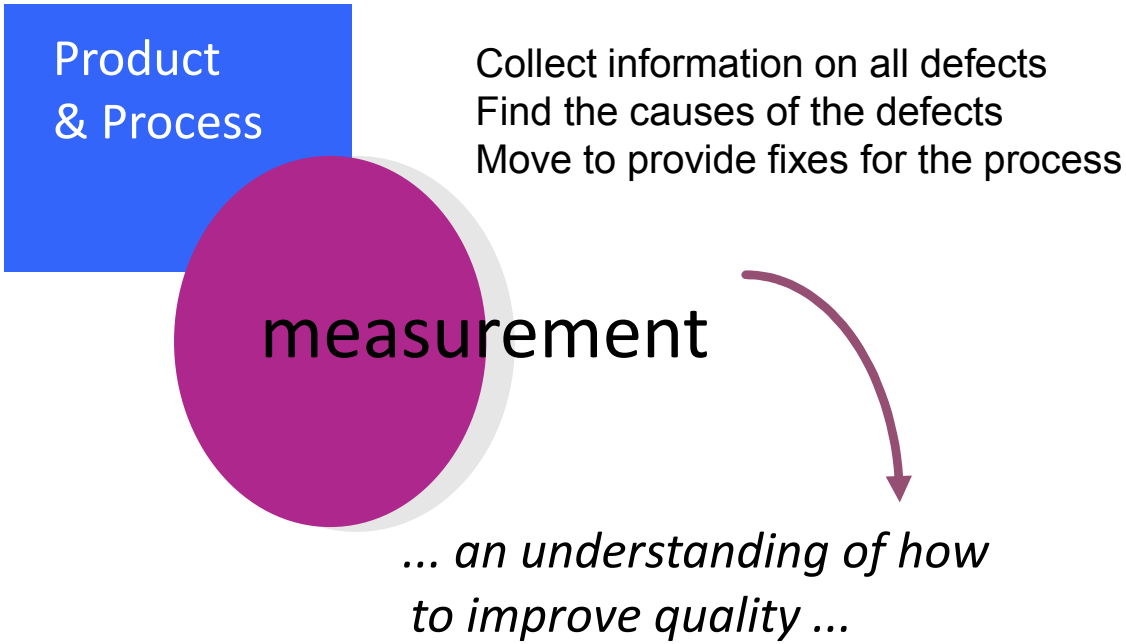
... there is no particular reason why your friend and colleague cannot also be your sternest critic.

Jerry Weinberg

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 SE task (e.g., design)
- number of minor errors (e.g., typos)
- number of major errors
  (e.g., nonconformance to req.)
- number of errors found during preparation

Statistical SQA



Static Testing Definitions

✓Architectural design refers to the high-level software system design

✓Defect classification is the process in which all defects identified during an inspection are classified by severity and type

✓Defect is a term for a problem that is not detected during the phase in which it was introduced but that was found in a later phase

✓Error is a term for a problem found during the phase in which it was introduced

✓Formal reviews are conducted at the end of each life cycle phase

✓Informal reviews are conducted on an as-needed basis

Non Monetary Benefits of Reviews

- **Because an appropriate "chunk" of work must be taken to a review, developers begin to think in terms of modularity and draw upon their knowledge of low coupling and high cohesion**

Different Roles of a Reviewer

Example Work Product Under Review									
Example Reviewer (Stakeholder)	**Project Plan**	**Risk Management Plan**	**SRS**	**SDD**	**Test Plan**	**Code**	**Unit Test**	**System Test**	**User Acceptance Test**
Project Leader	X	X							
Sponsor	X	X							X
Analyst			X	X					
Designer			X	X	X				
Database Administrator				X					
Network Administrator									
SQA		X	X	X	X	X	X	X	X
Testers		X			X	X	X	X	X
Users								X	X
Programmers						X	X		