Công Cụ & Phương Pháp Thiết Kế - Quản Lý (Phần Mềm)

TRAN KIM SANH
Instructor of DTU

Email: trankimsanh@dtu.edu.vn
Tel: 0987 409 464

Technical Review of Code

Agenda

- Insights from Studies

Contents: Insights from Studies

1. Individual vs Group Meeting Reviews
2. Reviews vs Testing
3. Are OO Reviews Different?
4. Is There an Optimal Review Duration?
5. What Causes us to Find More or Less Defects During a Review?
6. Data from Code Reviews at Cisco

Question

- **What are the types of technical review?**

  A. Walkthroughs, Code Reading, Pair Programming, Inspections

  B. Code Reading, Pair Programming, Inspections

  C. Walkthroughs, Code Reading, Pair Programming, Inspections, Customer Review

  D. Code Reading, Pair Programming

Question

- **What is the name of inspection process?**
  A. Software inspection
  B. Code inspection
  C. Fagan inspection
  D. All above
- **What is the result of the review?**
  A. Checklist
  B. Inspection Report.
  C. Code Defect
  D. All above

Question

- **What is Pair Programming?**

  A. A teamwork using Cisco tool to review code

  B. Two coders read and inspection code of each other

  C. A meeting of project's stakeholder

  D. All above

- **Who are involved in the inspection meeting?**

  A. Author, Inspector

  B. Moderator, Recorder

  C. Reader / Timekeeper

  D. All above

Question

- **According to Capers Jones in "Software Defect Removal Efficiency, Design and Code Inspections" usually remove … of product defects**

A. 40%
B. 50 - 60%
C. 60 - 70%
D. 70 - 85%

Question

- **All studies of Inspection have common results, the meeting will find very few errors compared to the reading code. Why are many companies still inspecting the code by meeting?**
  A. They use inspection for training
  B. Inspection can find the defect that the individual couldn't found
  C. Meetings create a schedule that people must work towards
  D. All above

Individual vs Group Reviews

- Are review meetings really better than individuals at detecting defects?
- Three studies:
  - (Design Reviews) Lawrence G. Votta, Jr., *Does every inspection need a meeting*?, Proceedings of the 1st ACM SIGSOFT symposium on Foundations of Software Engineering
  - (Code Reviews) Diane Kelly and Terry Shepard (2003) at the *Royal Military College of Canada*
  - (Architecture Reviews) Joint effort led by Reidar Conradi *between Ericsson Norway and two Norwegian colleges*, NTNU and Agder University (2003)

Votta

- Inspection meetings contribute only an additional 4% to the number of defects already found by private code-readings

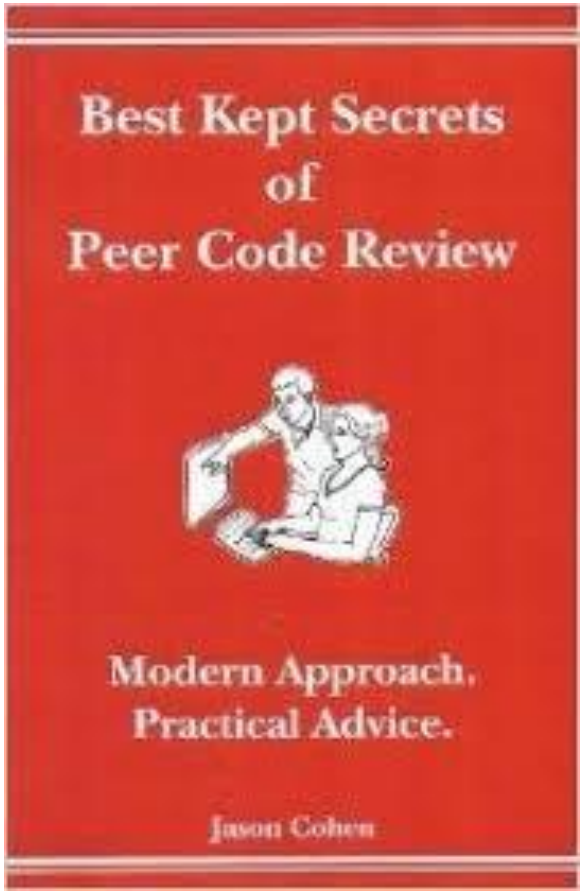
Referenced from Prof.Redley of CMU

Kelly & Shepard

- Set up an experiment comparing reviewers in isolation versus group meetings
  - Groups of developers read code individually to detect as many defects as possible
  - Then each group got together in an inspection meeting
- Results:
  - In total, 147 defects were found during the reading phases. Of these, 39 (26%) were discarded during meetings
  - The meeting phases added only 20 new defects to the existing 147. Furthermore, of those 20, two-thirds were relatively trivial in nature

Kelly & Shepard

- Not only did the meeting phases not contribute significantly to overall defect counts, the contribution was generally of a surface level nature rather than logic-level or algorithmic-level



Conradi

- In 38 experimentally-controlled inspections they found that:
  - 25% of the time was spent reading
  - 75% of the time in meetings
  - yet 80% of the defects were found during reading!
- They were 12 times more efficient at finding defects by reading than by meeting
- They had 5-7 people in each meeting – several more than Kelly or Votta or even Fagan recommends – so the number of defects found per man-hour was vanishingly small

Individual vs Group Reviews Analysis

- In addition to the # of defects found by your review process, consider the time consumed
  - Votta found that inspection meetings contribute only an additional 4% to the number of defects already found by private code-readings
  - Kelly found that about 2/3 of total person-hours were spent in reading and 1/3 in meetings, a discovery rate of 1.7 defects per hour for reading and 1.2 for meetings. Reading is 50% more efficient in finding defects than are meetings

Individual vs Group Reviews Analysis

- In addition to the # of defects found by your review process, consider the time consumed
  - …
  - Conradi found that they were 12 times more efficient at finding defects by reading than by meeting
- Are there some types of defects that are better found in meetings?

Reviews vs Testing

- Are reviews just duplicating what test will catch anyway?
- Study:
- • HP (1988)

HP Study

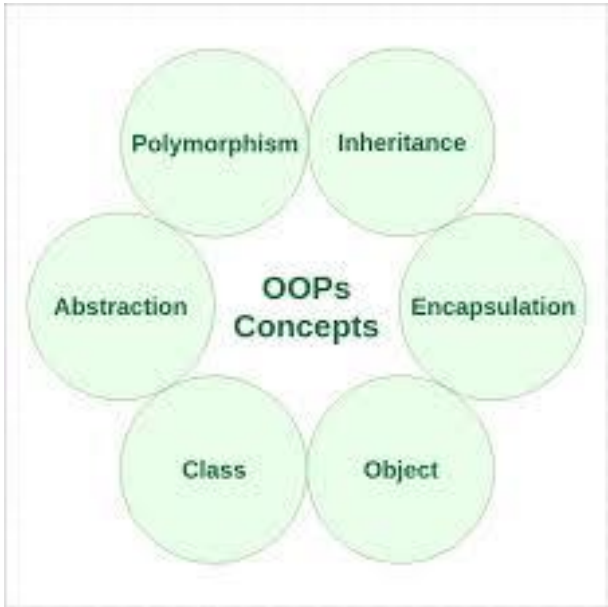
- This pilot study involved a single project with 30 development hours and 20 review hours – 13 hours in pre-meeting inspection and 7 hours in meetings
- They collected enough information on each defect to determine "Is there any test that QA could have reasonably performed that would have uncovered this defect?"
  - Only 4 of the 21 defects could conceivably been caught during a test/QA phase
  - They further postulate that it would have taken more total engineering hours to find and fix those 4 in QA rather than in inspection

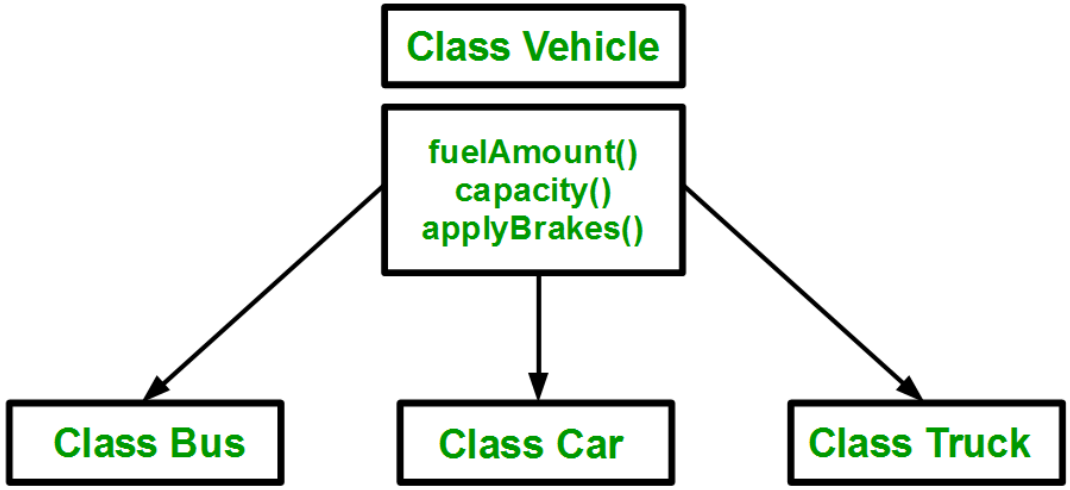
Are OO Reviews Different?

- Given that object-oriented (OO) code has different structural and execution patterns than procedural code, what review types work best?
  - Study done by Dunsmore, A., Roper, M., Wood, M. Object-Oriented Inspection in the Face of Delocalisation, Proceedings of the 22nd International Conference on Software Engineering (ICSE) 2000, pp. 467-476, June 2000

Are OO Reviews Different?

- Given that object-oriented (OO) code has different structural and execution patterns than procedural code, what review types work best?





Are OO Reviews Different?

- Three types of reviews used:
  - The "checklist review" gives the reviewers a specific list of things to check for at the class, method, and class- hierarchy levels
  - The "systematic review" gives the reviewers a a reading plan that directed their attention to the code in a certain order and supplied additional information according to a systematic set of rules
  - The "use-case review" gives the reviewers a set of ways in which we expect the code to be used by other code in the system.

OO Review Results

- The checklist method was most successful
- The defects found in each of the three techniques didn't overlap completely

	Checklist	Systematic	Use-Case
Defects (of 14)	7.3	6.2	5.7
False-Positives	3.4	3.2	2.9
Inspection Time	72.1	77.0	81.9
Defect Rate	6.07	4.83	4.18

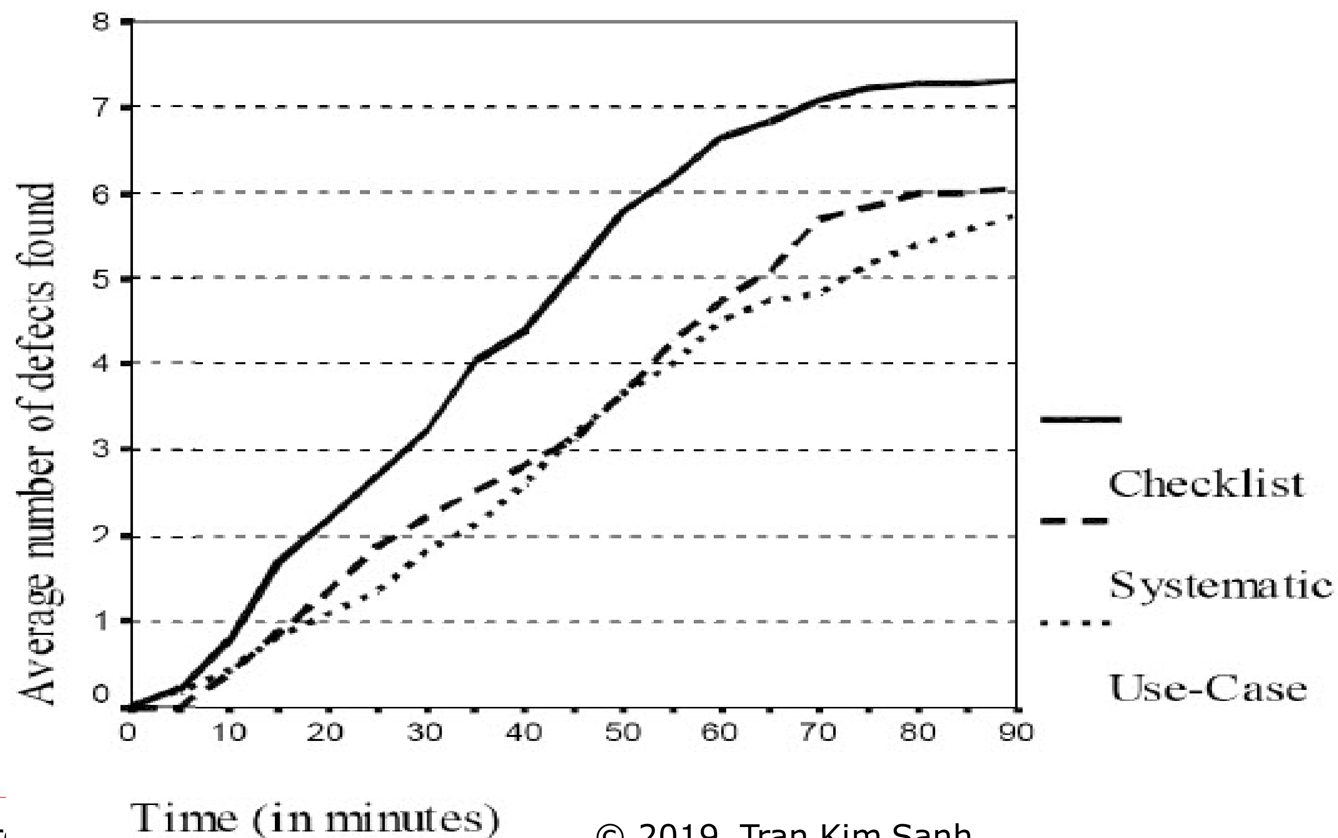
Inspection time is in minutes. Defect rate is in defects per hour

Optimal Review Duration?

- During the 3rd experiment in the OO Study the exact time that each of the defects were found during the inspection was logged
  - Are most defects found quickly?
  - Is there a drop-off point after which defects are no longer found?
  - Is there a difference between the three types of review?

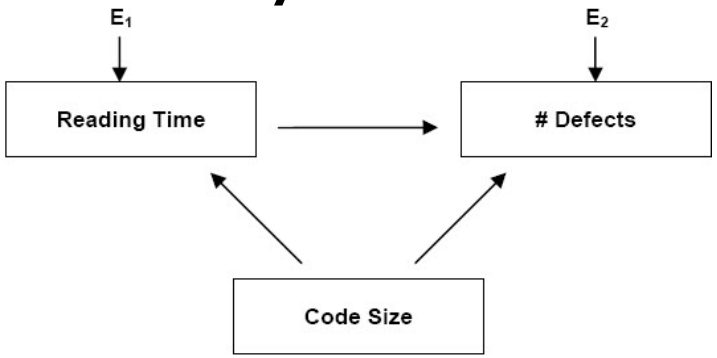
Optimal Review Duration?

- Defect rate is constant for 1 hour, then levels off
- No defects found after 90 mins



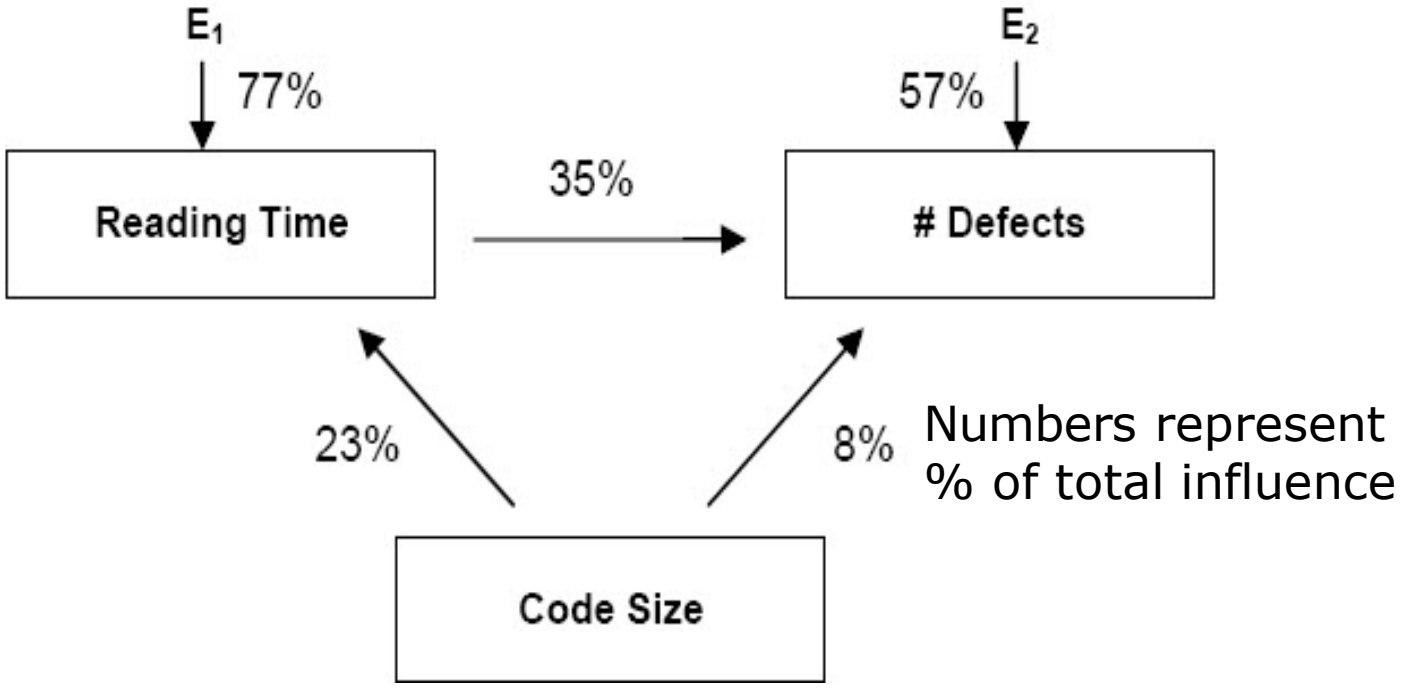
What Causes us to Find More or Less defects During a Review?

- Causal model for the two largest factors that determine the number of defects found during review
- Arrows indicate a causal link
- The "E" values represent external factors not accounted for by the model



What Causes us to Find More or Less defects During a Review?

- Reading time is twice as influential as code size
- "External factors" are more important than other factors



Implications

- If you want to find more defects, spend more time reviewing
- You could reduce the amount of code under inspection, but that's less important
  - Even though various external factors are collectively more influential, the individual reviewer often cannot control those factors; reading time is something that can be controlled directly
- You can't average all your metrics and say "We should find X defects per 1000 lines of code"

Code Collaborator

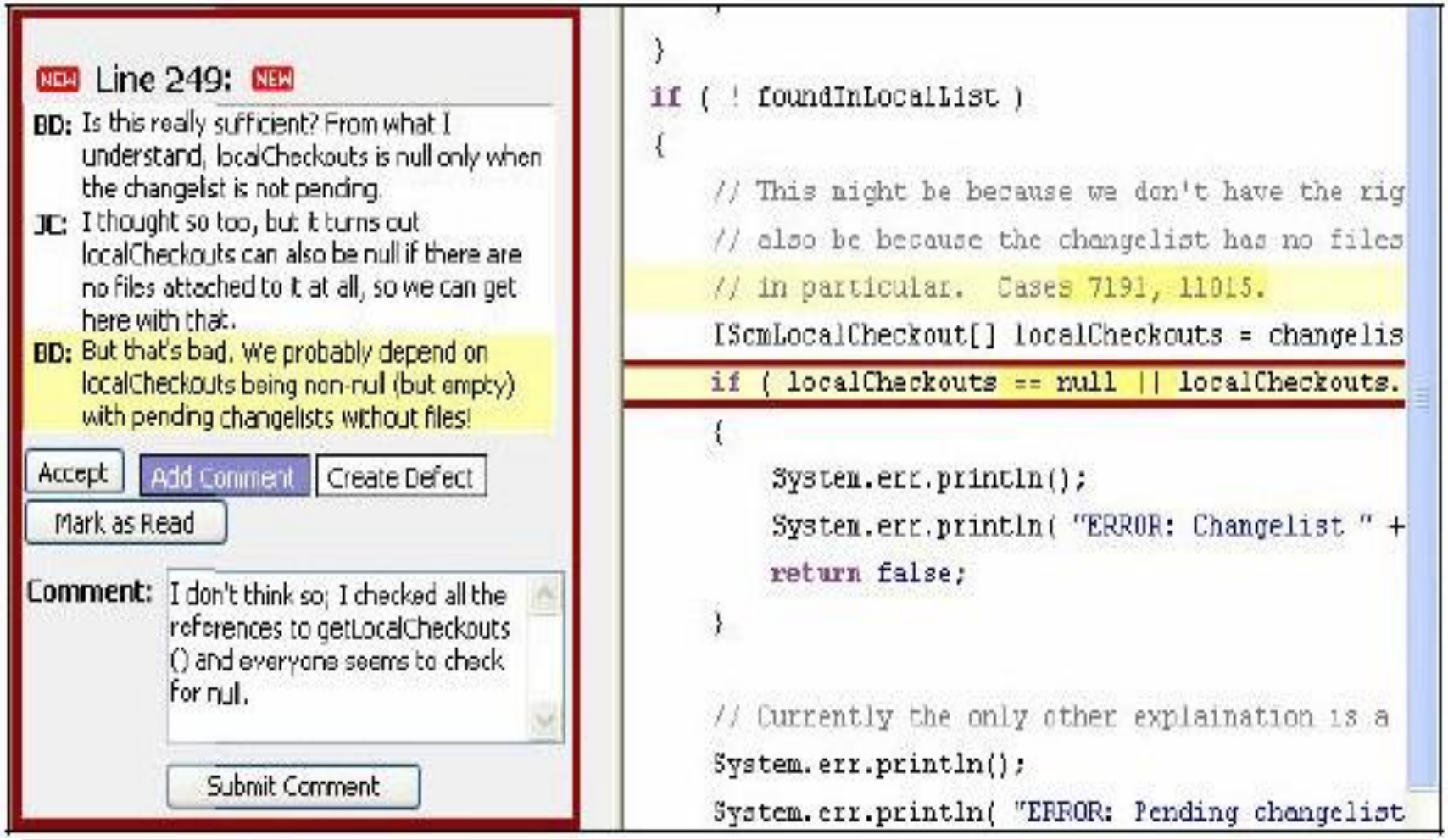
- 10-month case study of peer code review in the Cisco MeetingPlace product
- 2500 reviews of 3.2 million LOC written by 50 developers
- Used "lightweight" code review process
  - No peer review meetings
  - Individual reviews using Smart Bear Software's Code Collaborator system for tool-assisted peer review
- Every code change was reviewed before it was checked in to source control library

Code Review Process at Cisco

- Authors invite 1 or more reviewers
- Defects are logged like comments
- Author fixes defects and posts fixes
- Once all reviewers agree no defects are still open, the review is complete and the author can check in their changes
- Tool automatically tracks metrics

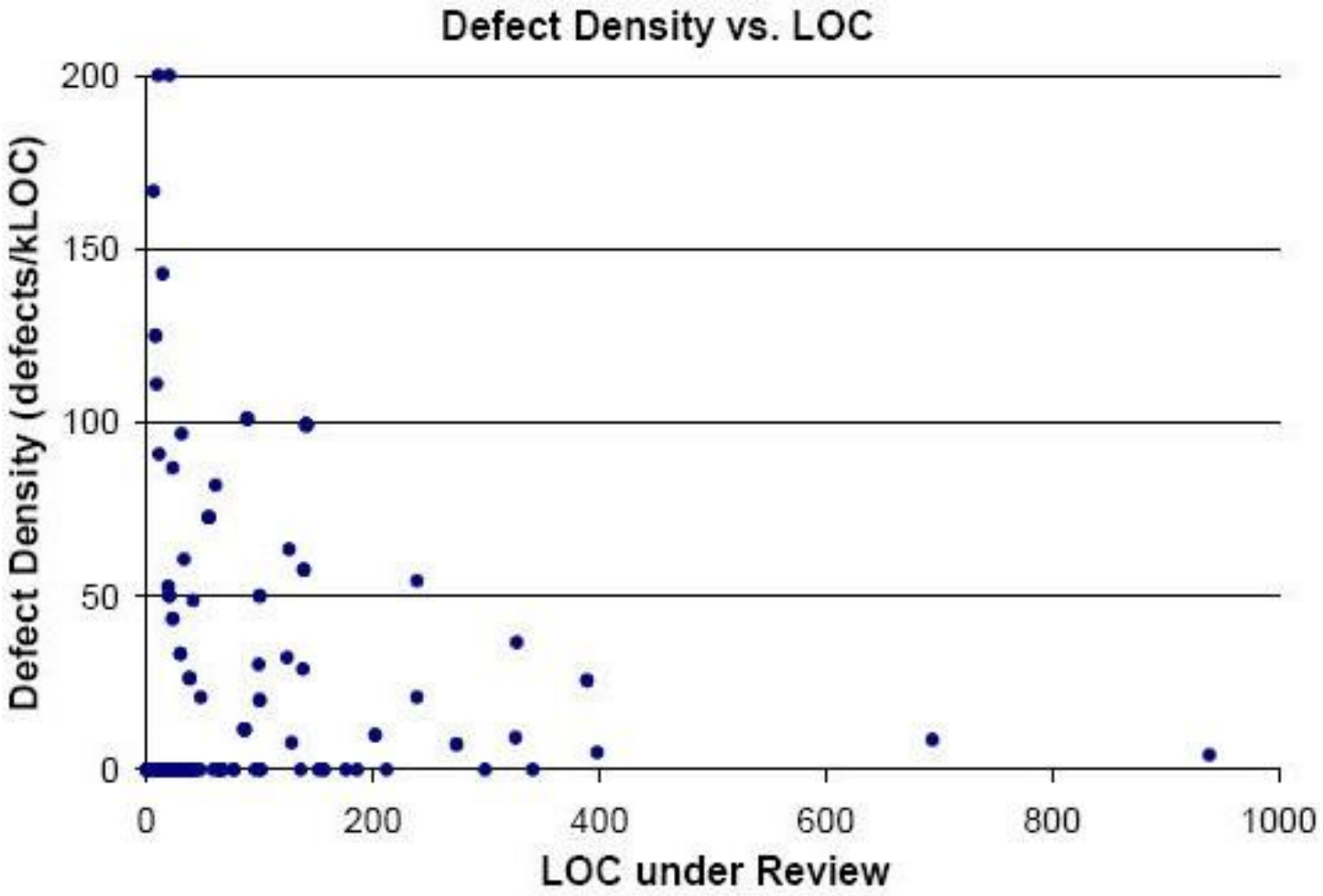
Code Review Process at Cisco

- Code Collaborator screenshot



Cisco Reviews - Results

- Review average = 32 defects per KLOC



Cisco Reviews - Results

- LOC under review should be under 200, not to exceed 400
  - More LOC overwhelms reviewers and defects are not uncovered
- Reviewing < 300 LOC/hour result in best defect detection
  - Expect to miss significant % of defects if > 400 LOC /hr
- Authors who prepare the review with annotations and explanations have far fewer defects than those that do not
  - Probably because authors are forced to self- review their code

Cisco Reviews - Results

- Total review time should be between 60 and 90 minutes
- Expect defect rates around 15 per hour.
  - Can be higher only with less than 175 LOC under review

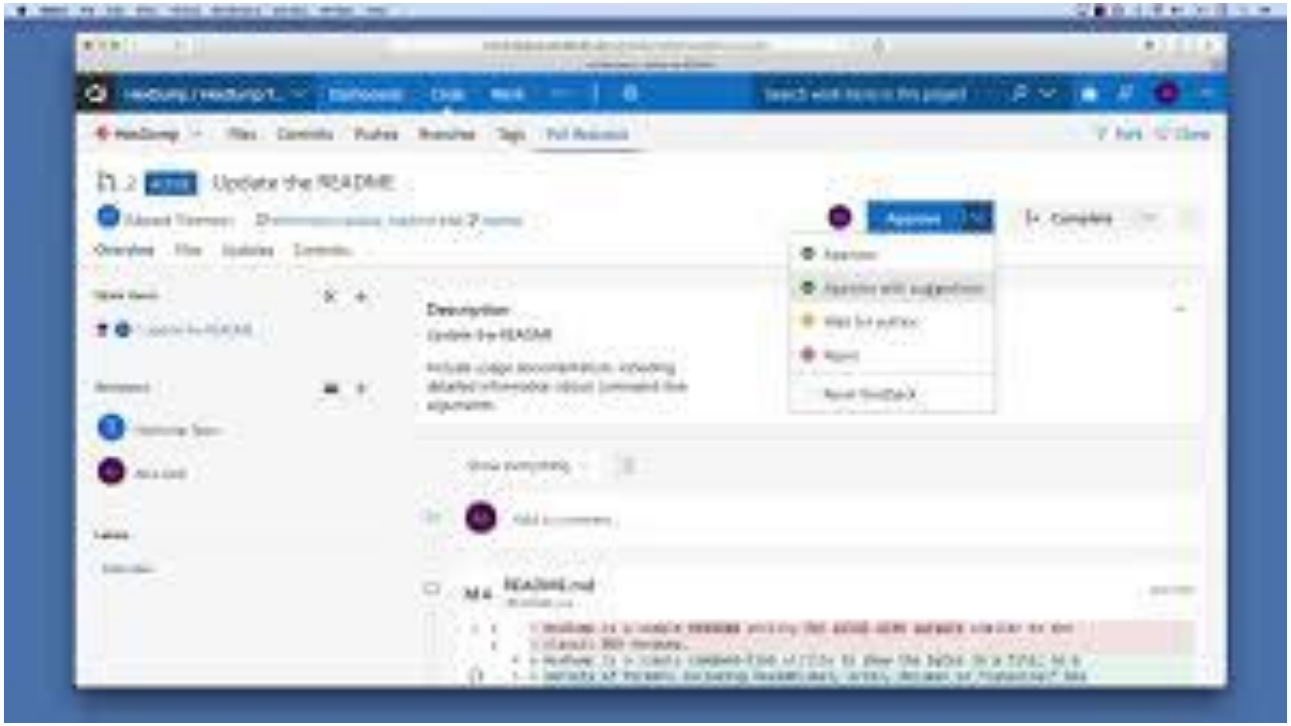
Jason Cohen. Best Kept Secrets of Peer Code Reviews

Summary

- Any review will find defects. The question is, how do we optimize our time spent in finding defects?
- Take the time to understand the review process for the artifacts you are reviewing
- Keep your reviews to 60 minutes
- If you want to find more defects, spend more time reviewing
- Inspection meetings need not be in person
- Be wary of “average defect rates”

Group discussion

- What are the functions of Cisco Collaborate
- (4 students – 10 minutes)



Video link

- https://www.youtube.com/watch?v=qMusrHLNfUU

References

- Dunsmore, A., Roper, M., Wood, M. Object-Oriented Inspection in the Face of Delocalisation, Proceedings of the 22nd International Conference on Software Engineering (ICSE) 2000, pp. 467-476, June 2000
- Diane Kelly and Terry Shepard. Code Reviews at the Royal Military College of Canada (2003)
- Joint effort led by Reidar Conradi. Architecture Reviews, between Ericsson Norway, NTNU and Agder University (2003)

References

- https://smartbear.com/product/collaborator/overview/