جامعة حلوان

Helwan University

Faculty of Computers and Information

Software Engineering II Lecture Notes 2

DR. MAI HAMDALLA

mai@fci.helwan.edu.eg

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Housekeeping

- Thank you for the acknowledgements
- FAQ so far:
  - How do we study for this course?
  - How is the exam going to look like?

Software Engineering VS. Computer Science

- **Computer science** focuses on theory and fundamentals.

- **Software engineering** is concerned with the practicalities of developing and delivering useful software.

Software Engineering VS. System Engineering

- **System engineering** is concerned with all aspects of computer-based systems development including *hardware*, *software* and *process* engineering.

- **Software engineering** is part of this more general process.

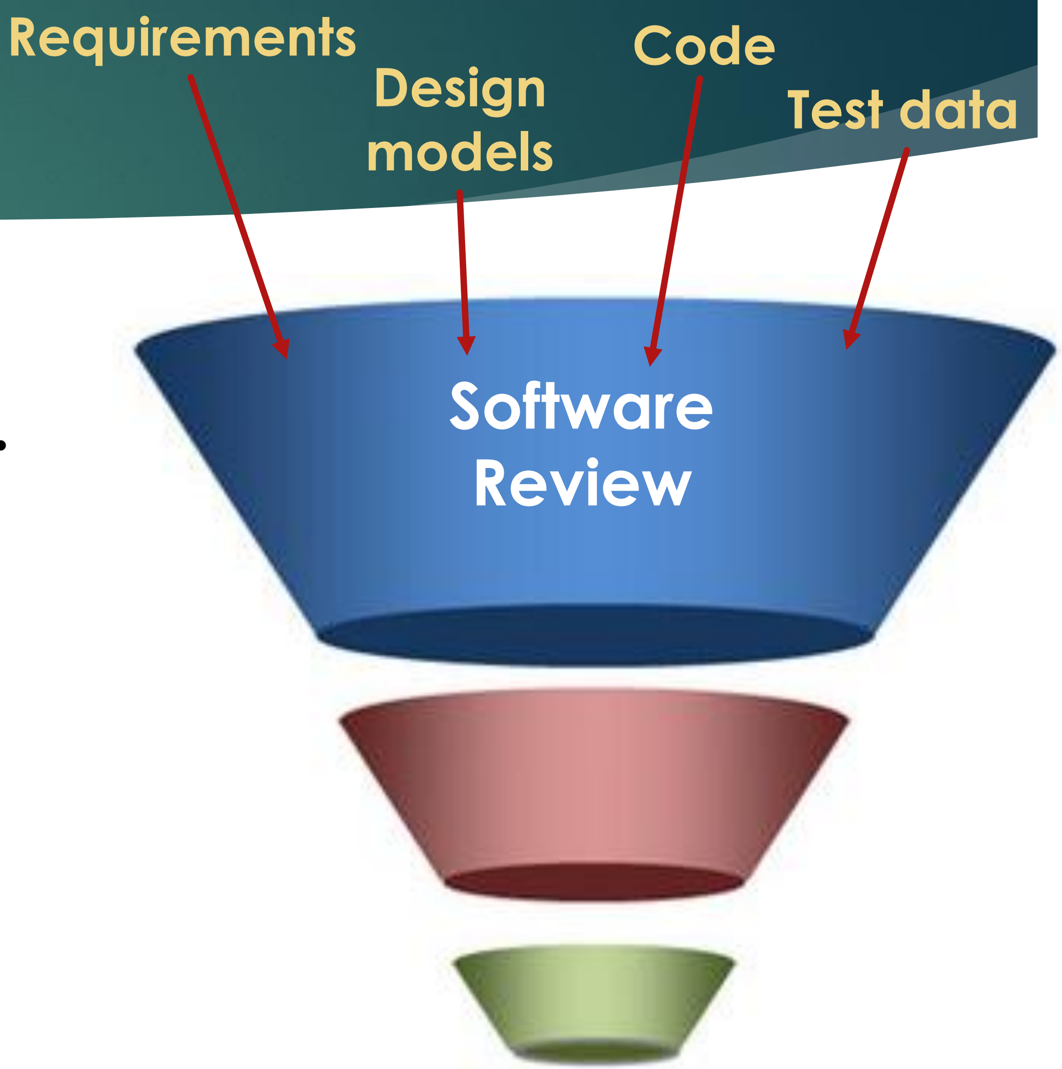
Project

- Project Focus
- Ideas

Chapter 15:
Review Techniques

Software Reviews

- Applied in various points during software engineering.
- Serve to uncover errors and defects.



Software Reviews

- Error: quality problem discovered by software engineers **before** software release.

- Defect/Fault: quality problem that is discovered **after** software is released to user.

Software Reviews

- A review is the use of a diverse group of people to:
  1. Point out needed improvements in the product.
  2. Conform the parts that don’t need improvements.
  3. Achieve technical work of uniform quality.

Types of Reviews

- Informal Meetings

- Formal Meetings

  Presentation to customers, management, tech staff… etc.

Formal Reviews

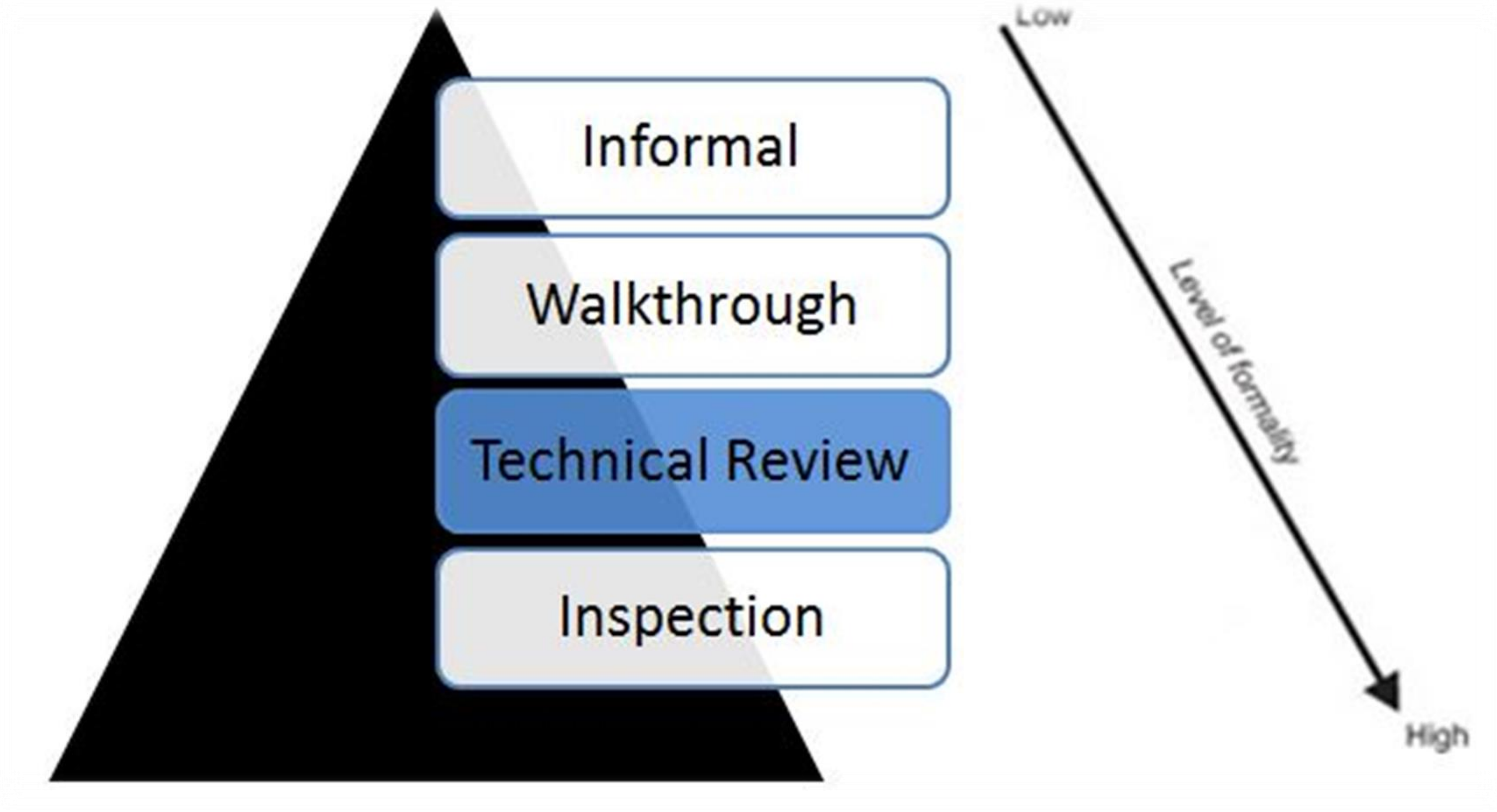
- Formality
- Roles
- Planning and preparation
- Structure
- Outcome: accept/reject/accept provisionally
- Follow-up

Informal Reviews

- Casual meeting
- No preparation
- No agenda
- No follow-up
- Example:
  - pair programming

- Less effective than a formal review
  - Can improve effectiveness using checklists

Types of Reviews



Informal

Walkthrough

Technical Review

Inspection

Formal Technical Reviews (FTR)

- Assess software engineering work products in an effort to uncover and remove errors before they are propagated to the next activity.

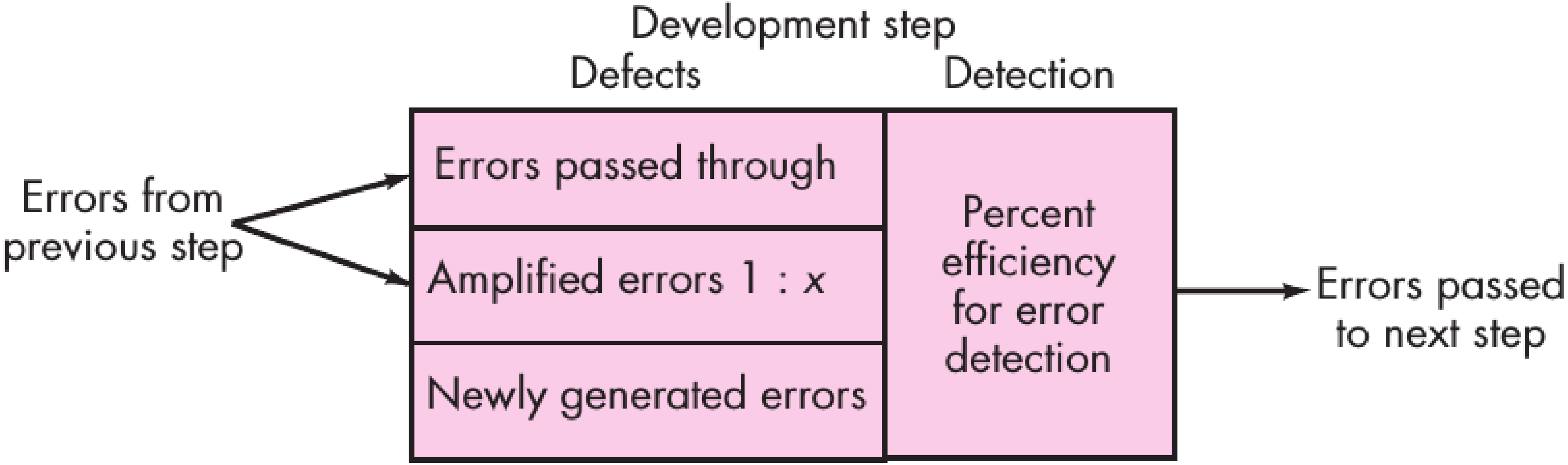
Defect Amplification and Removal

Cost Impact of SW Defects

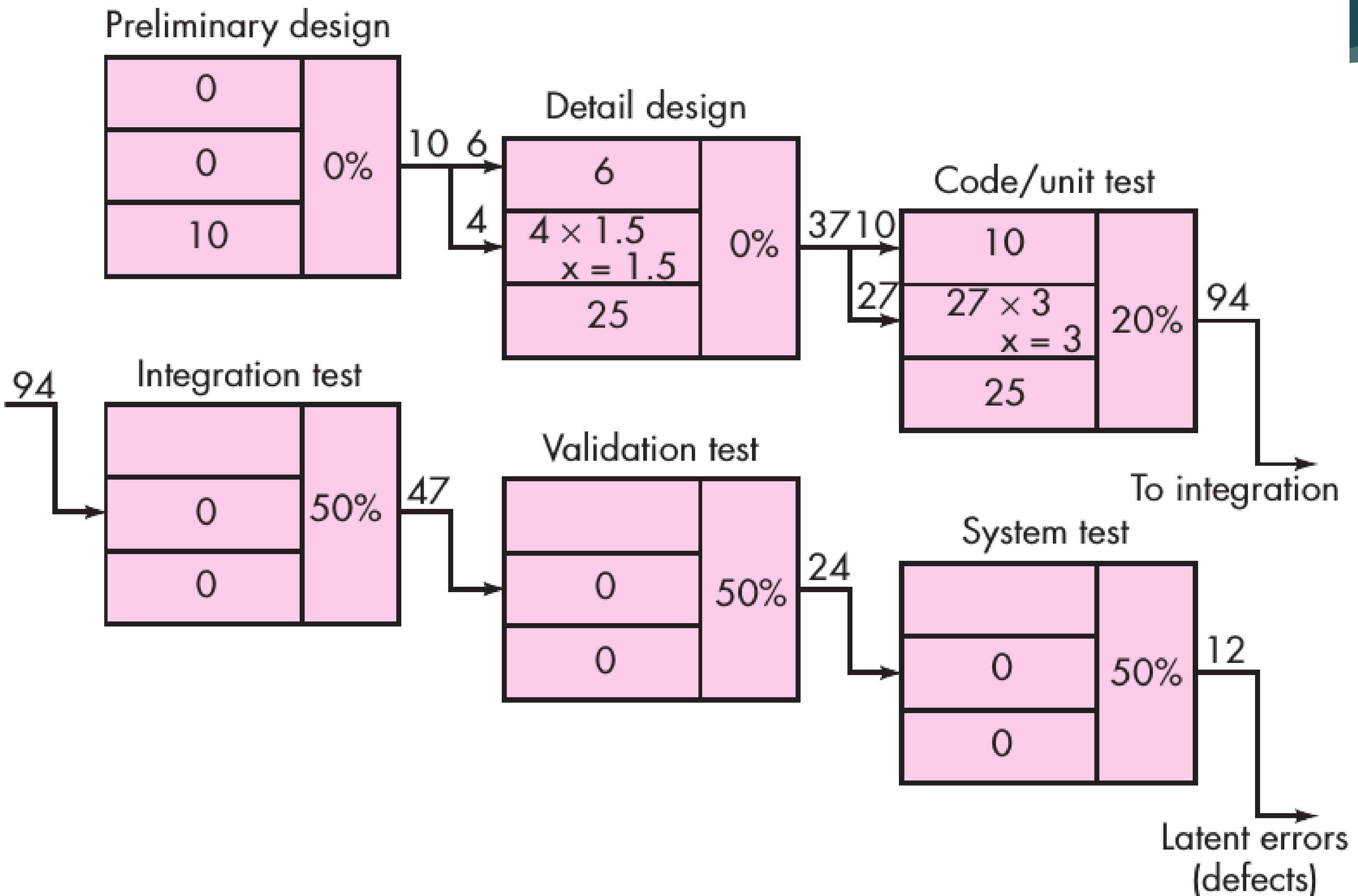
Technical reviews aim at preventing errors from becoming a defect.

- Design activities introduce 50–60% of all errors
- Review techniques uncover 75% of design flaws
- Thus reducing the cost of subsequent activities

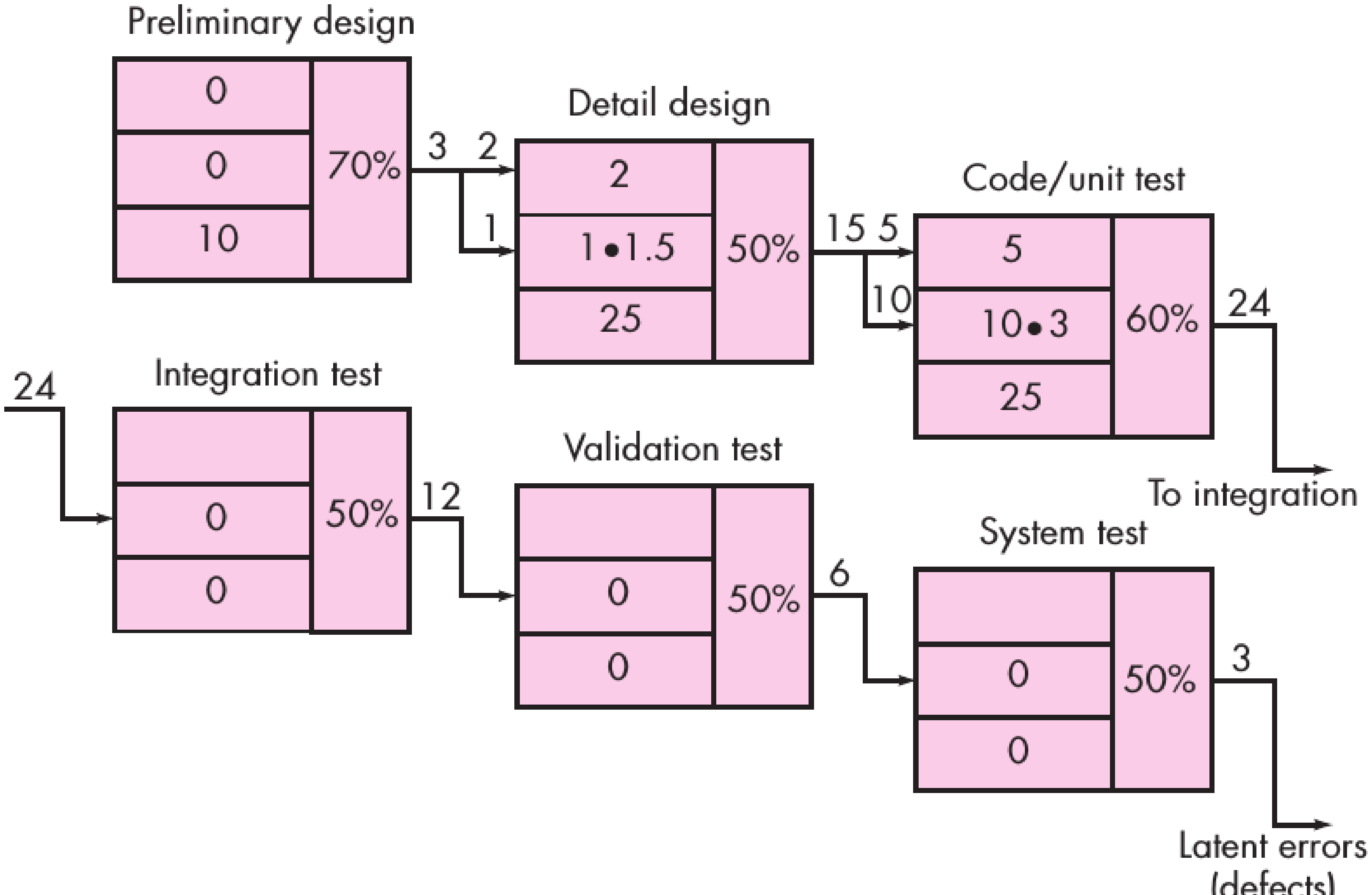
Defect Amplification Model



Defect Amplification Model **No reviews**



Defect Amplification Model **With reviews**



Defect Amplification Model: cost

- Errors within each step is multiplied by cost to correct the error
  - 1.5 cost units for design
  - 6.5 cost units before test
  - 15 cost units during test
  - 67 cost units after release

Defect Amplification Model: cost

- The total cost for development and maintenance when reviews are conducted is 783 cost units
- When no reviews are conducted, total cost is 2177 units
- **Reviews cost time and money, but they pay off**

Review Metrics

- Review process can be measured so as to be improved over time
- Important to understand the benefits versus cost (the scientific/research aspect of software engineering)

Review Metrics

The following metrics can be collected for each review conducted:

- *Preparation effort,* E_p – review effort for a work product prior to the actual review meeting
- *Assessment effort,* E_a – effort during the actual review
- *Rework effort,* E_r

Review Metrics

- *Work product size, WPS* – size of the work product (e.g., the number of UML models, or the number of document pages, or the number of lines of code)
- *Minor errors found, Err_{minor}* – (< pre-specified effort to correct)
- *Major errors found, Err_{major}*

Analyzing Metrics

- $E_{review} = E_p + E_a + E_r$
- $Err_{tot} = Err_{minor} + Err_{major}$
- $\text{Error density} = Err_{tot} / WPS$

- WPS = 18 UML diagrams or 32 pages
- Err_{tot} = 22
- Error density = 1.2 errors per UML diagram
  or
  Error density = 0.68 errors per page

Analyzing Matrix

- Across many projects, average values for error density is calculated

  - Average error density is 0.6 per page
  - Some new requirement model is 32 pages long
  - Roughly we should find 19 or 20 errors
  - What if we find only 6 errors?

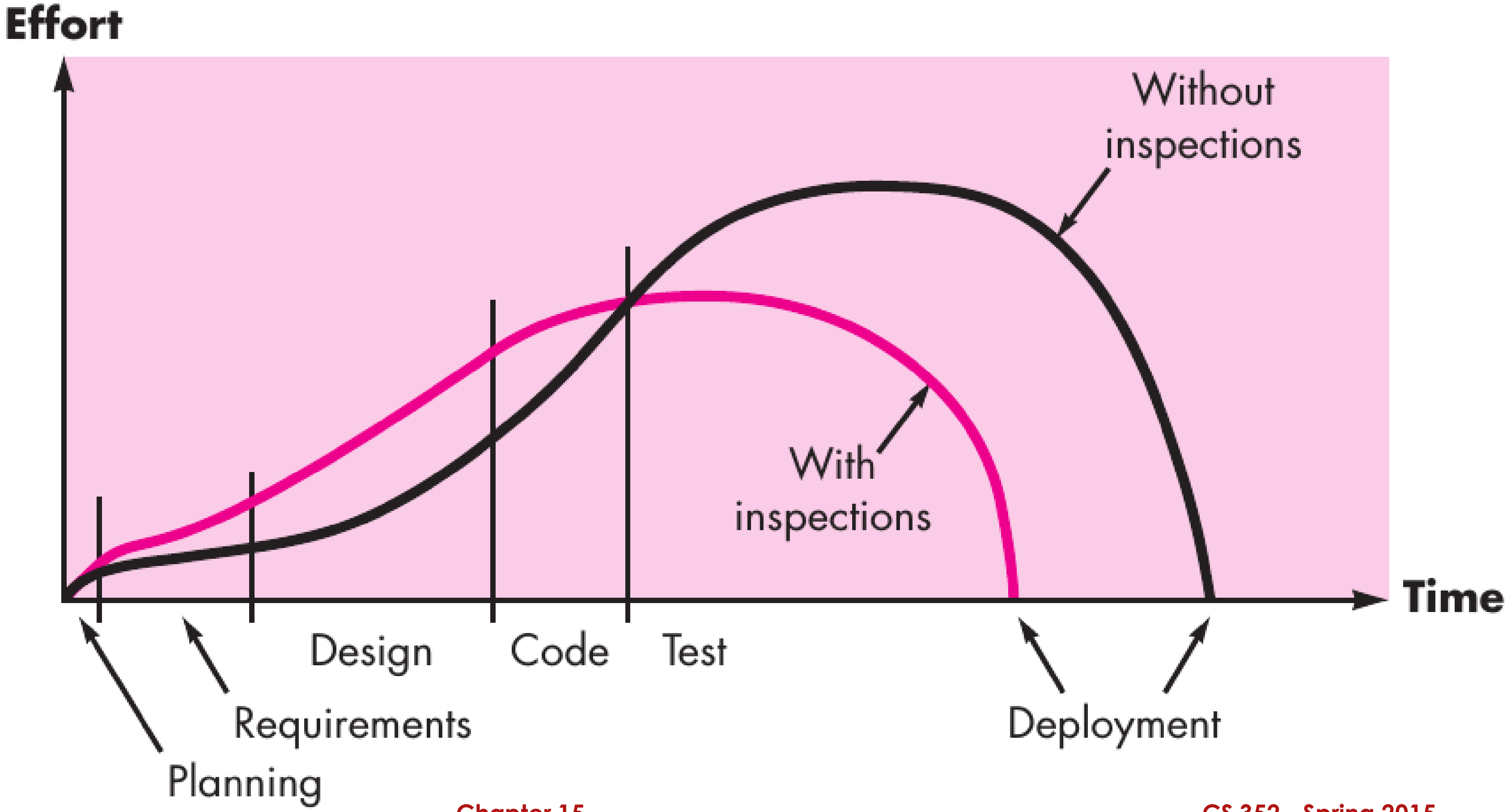
Cost Effectiveness for Reviews

- To assess the effectiveness of reviews and their cost benefit:
  - Reviews must have been completed
  - Review metrics have been collected
  - Average data have been computed
  - The downstream quality of the software is measured (via testing)

Cost Effectiveness for Reviews

- Hewlett Packard
  - Hewlett Packard reported a 10 to 1 return on investment
  - Product delivery accelerated by an average of 1.8 calendar months
- AT&T
  - Overall cost of software errors reduced by a factor of 10
  - Quality improved by an order of magnitude
  - Productivity increased by 14 percent

Cost Effectiveness for Reviews

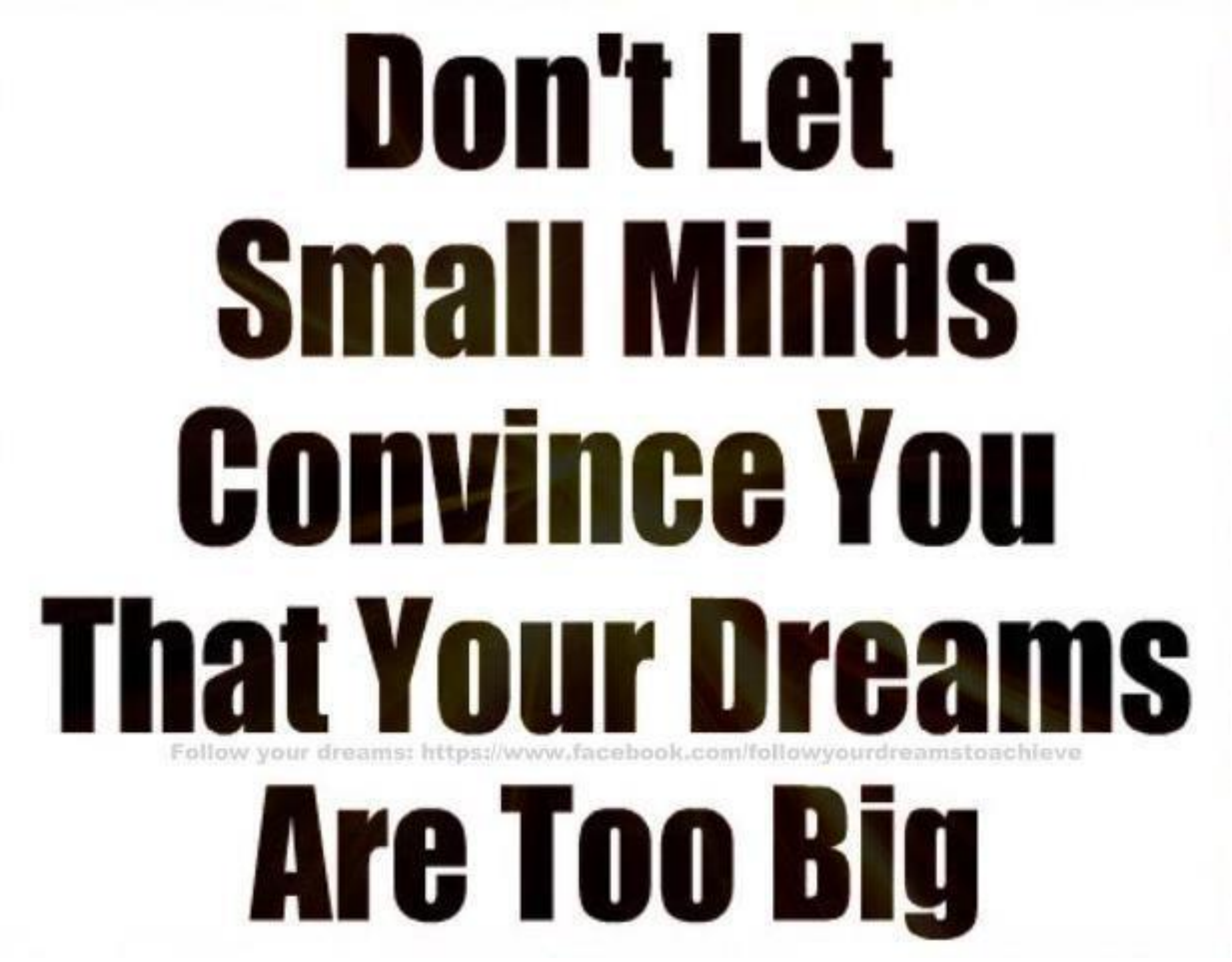


Chapter 15: Review Techniques

You are responsible for:

- Reading the whole chapter from the book
- Solving the questions at the end of the chapter

Dream BIG!



Don't Let Small Minds Convince You That Your Dreams Are Too Big

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