Software Engineering

Part (II)-An Introduction to Software Engineering

By: Mehran Alidoost Nia
Shahid Beheshti University, Fall 2023

(Software) Engineering

➢ Engineering?
  ○ The use of scientific principles to design and build machines, structures, and other items.

➢ Software Engineering?
  ○ It deals with the design, development, testing, and maintenance of software applications.

Software

➢ Computer software is a work product that software professionals build and then support over many years.

➢ They include programs that execute within computers of any size and architecture.

Questions?

➢ Why does it take so long to get software finished?

➢ Why are development costs so high?

➢ Why can't we find all errors before we give the software to our customers?

➢ Why do we spend so much time and effort maintaining existing programs?

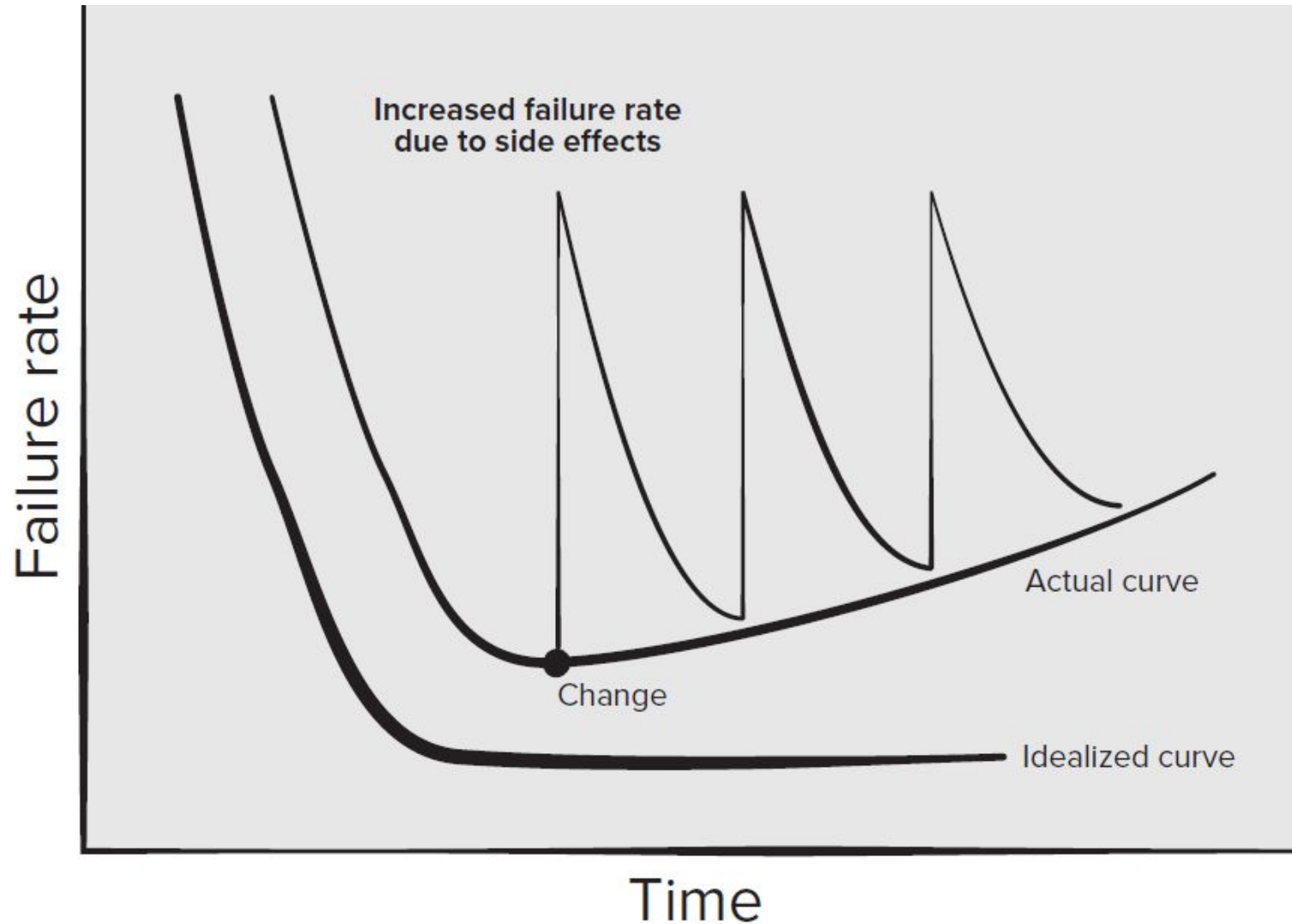➢ Why do we continue to have difficulty in measuring progress as software is being developed and maintained?

Defining Software

(1) Instructions (computer programs) that when executed provide desired features, function, and performance.

(2) Data structures that enable the programs to adequately manipulate information.

(3) Descriptive information in both hard copy and virtual forms that describes the operation and use of the programs.

Failure curve for hardware

"Infant mortality"

"Wear out"

Failure rate

Time
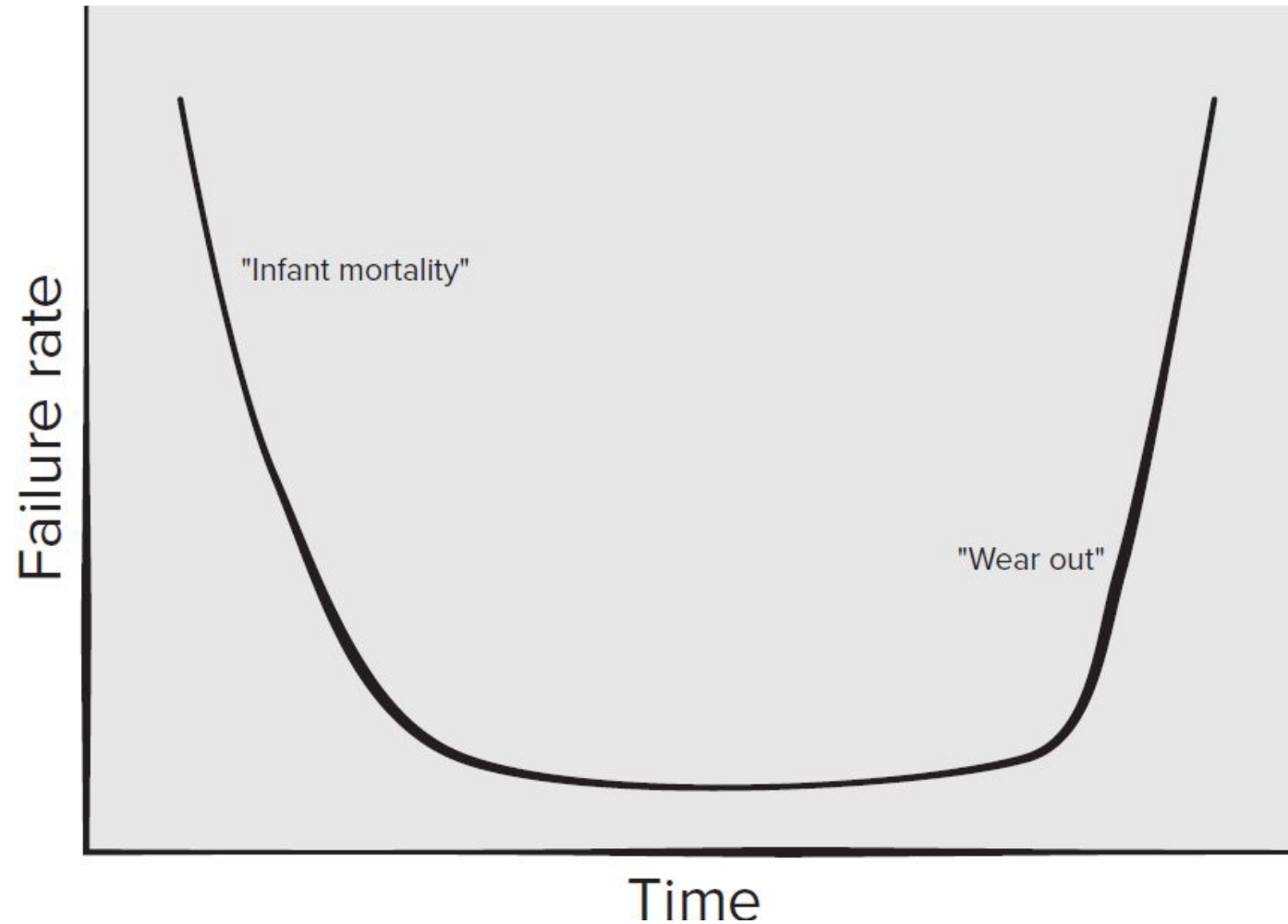
Failure curve for software

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Software Application Domains

➢ System software

➢ Application software

➢ Engineering/scientific software

➢ Embedded software

➢ Product-line software

➢ Web/mobile applications

➢ Artificial intelligence software

Legacy Software

Legacy Software

"Legacy software systems . . . were developed decades ago and have been continually modified to meet changes in business requirements and computing platforms. The proliferation of such systems is causing headaches for large organizations who find them costly to maintain and risky to evolve."

Legacy Software
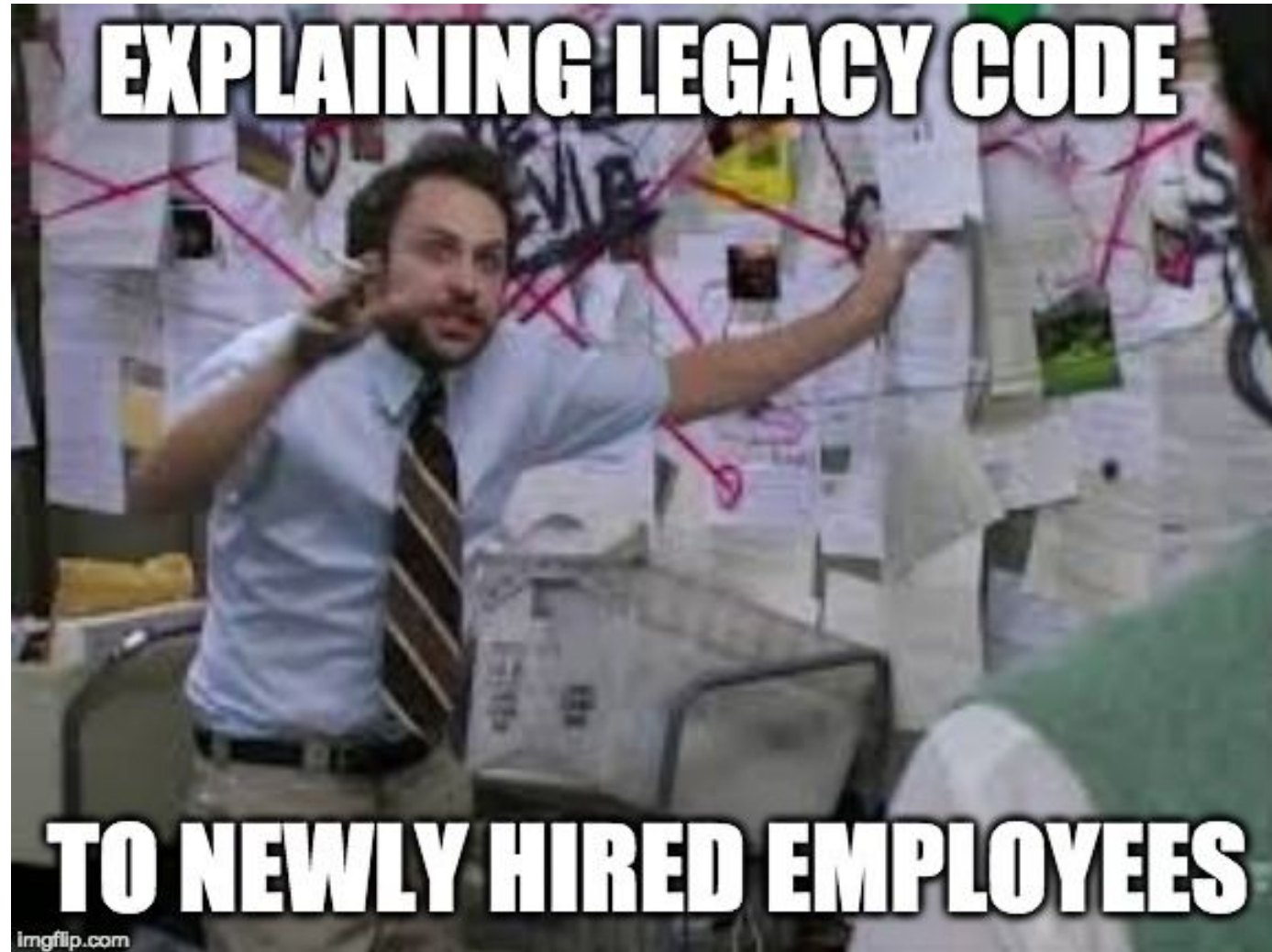
Software Engineering Layers

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The Software Process

➢ A process is a collection of activities, actions, and tasks that are performed when some work product is to be created.
  ○ Activity -> e.g., communication with stakeholders
  ○ Action -> e.g., architectural design
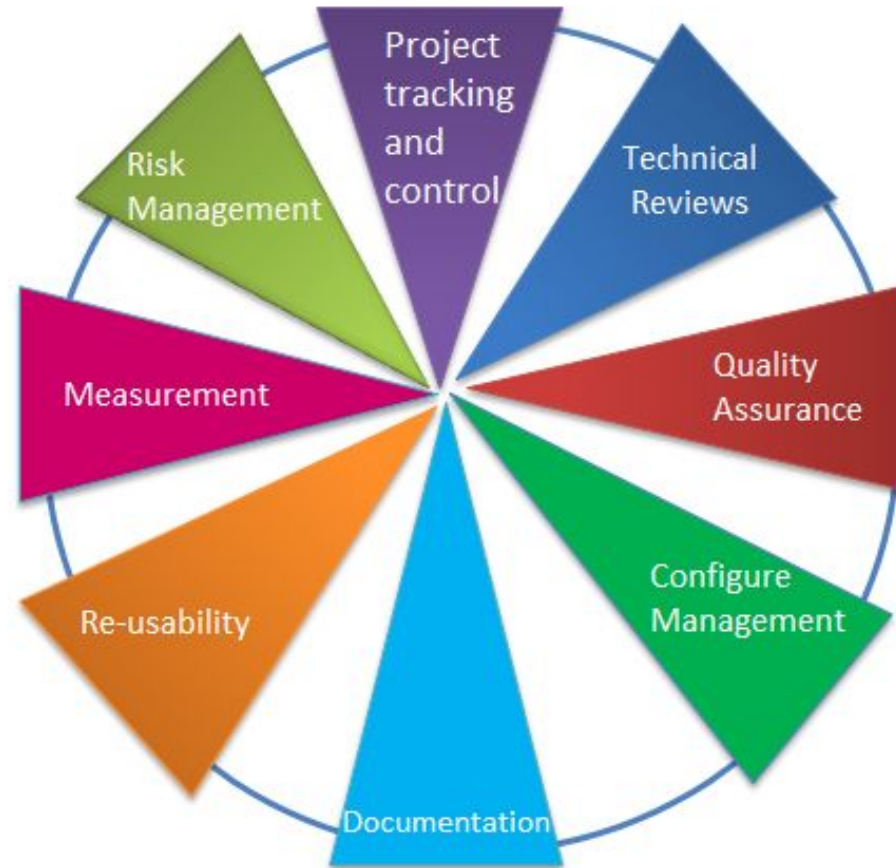 ○ Task -> e.g., conducting a unit test

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The Process Framework

➢ Communication

➢ Planning

➢ Modeling

➢ Construction

➢ Deployment

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Umbrella Activities

➢ In general, umbrella activities are applied throughout a software project and help a software team manage and control progress, quality, change, and risk.

Umbrella Activities

Courtesy: https://webeduclick.com/umbrella-activities-in-software-engineering/

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The Essence of Software Engineering

1. Understand the problem (communication and analysis).

2. Plan a solution (modeling and software design).

3. Carry out the plan (code generation).

4. Examine the result for accuracy (testing and quality assurance).

By: George Polya

Seven Principles of Software Engineering

1. The Reason It All Exists.

     - A software system exists for one reason: to provide value to its users.

2. KISS (Keep It Simple, Stupid!).

     - All design should be as simple as possible, but no simpler.

3. Maintain the Vision.

4. What You Produce, Others Will Consume.

Seven Principles of Software Engineering

5. Be Open to the Future.

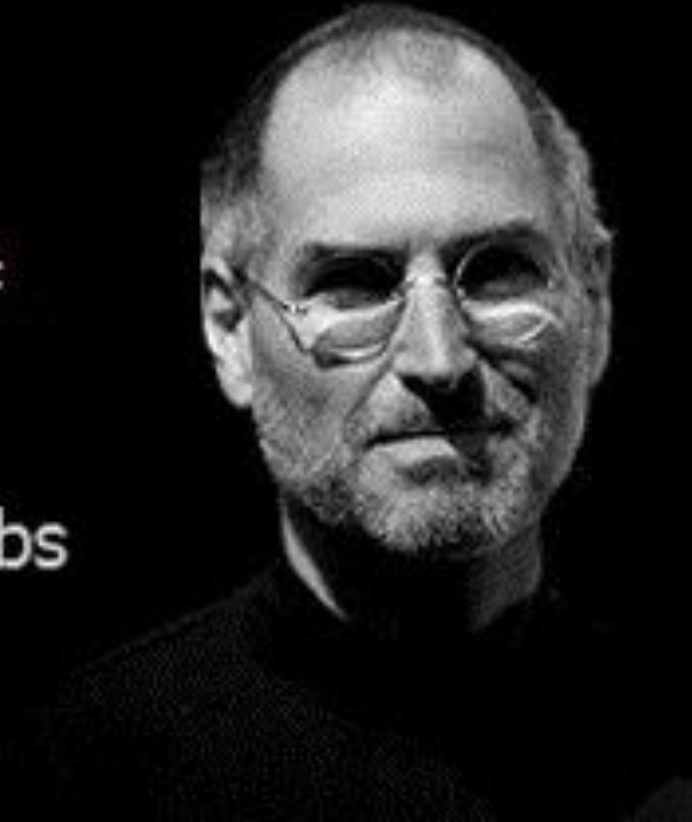   - Systems must be ready to adapt to these and other changes.

6. Plan Ahead for Reuse.

7. Think!

   - Placing clear, complete thought before action almost always produces better results.

The Quote of the Day

Everyone should know how to program a computer, because it teaches you how to think!

– Steve Jobs

On-Site Challenge (I)

Readings

➢ Software Engineering: A Practitioner's Approach, Roger Pressman and Bruce Maxim, 9th Edition, September 2019, Chapter 1.