INTRODUCTION

Software Engineering

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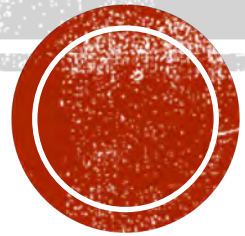
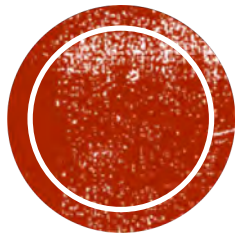




THE NATURE OF SOFTWARE

WHAT IS SOFTWARE?

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

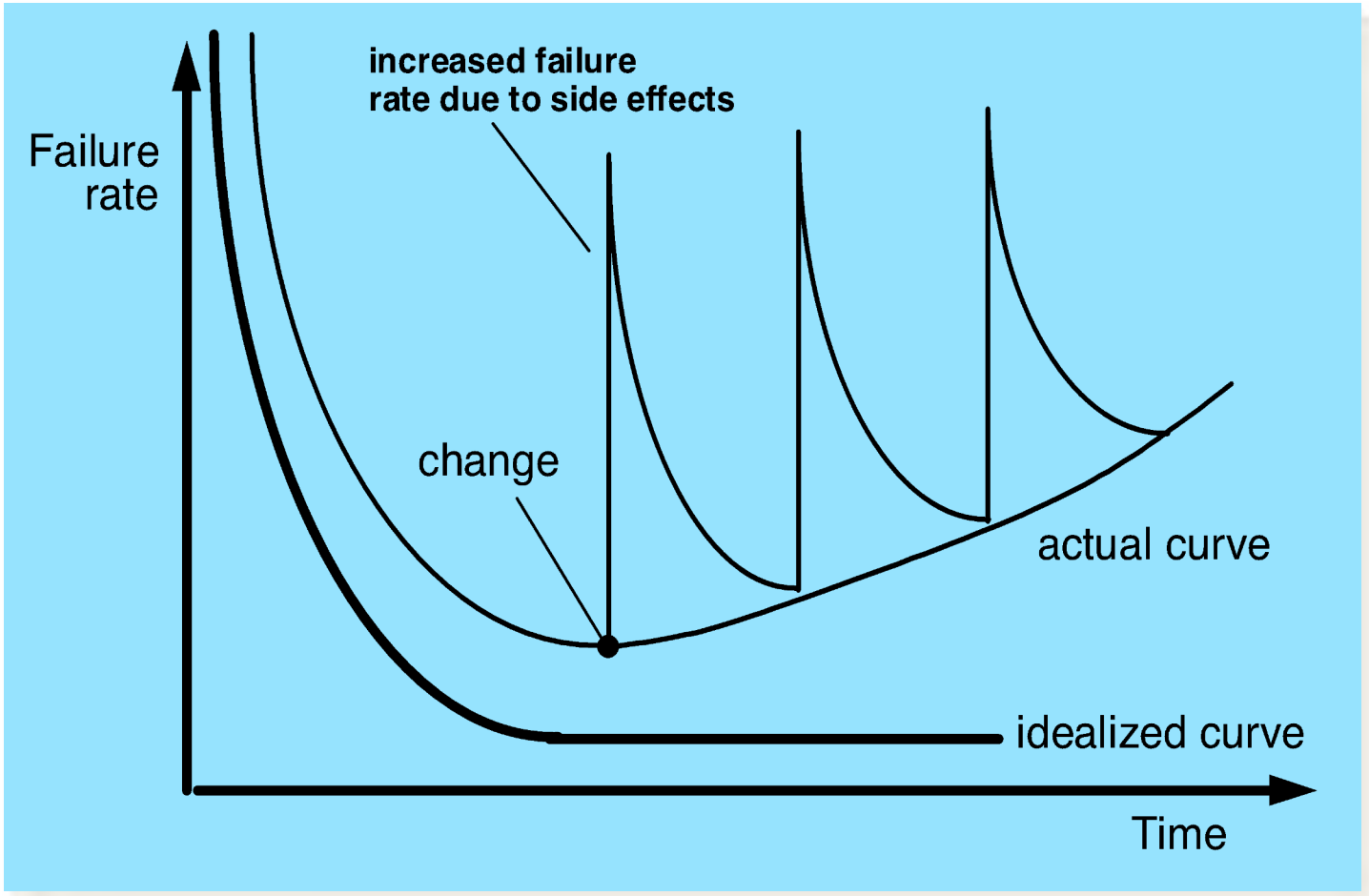
Data structures that enable the programs to adequately manipulate information

Documentation that describes the operation and use of the programs

Software is developed or engineered, it is not manufactured in the classical sense

Software doesn't "wear out"

WEAR VS. DETERIORATION



SOFTWARE APPLICATIONS

System software

Application software

Engineering/Scientific software

Embedded software

Product-line software

Web/Mobile applications)

AI software (robotics, neural nets, game playing)

LEGACY SOFTWARE:
WHY IT MUST CHANGE?

1

software must be adapted to meet the needs of new computing environments or technology.

2

software must be enhanced to implement new business requirements.

3

software must be extended to make it interoperable with other more modern systems or databases.

4

software must be re-architected to make it viable within a network environment.

WEBAPPS

Modern WebApps are much more than hypertext and images

Modern WebApps are augmented with tools, technologies, and interactive computing capability

WebApps may be standalone or integrated with corporate databases and business applications

Semantic web technologies (Web 3.0) have evolved into sophisticated corporate and consumer applications that require web linking, flexible data representation, and application programmer interfaces (API's) for access

The aesthetic nature of the content remains an important determinant of the quality of a WebApp.

CHARACTERISTICS OF WEBAPPS

Data Driven

The primary function of many WebApps is to use hypermedia to present text, graphics, audio, and video content to the end-user.

Content Sensitive

The quality and aesthetic nature of content remains an important determinant of the quality of a WebApp.

Continuous Evolution

Unlike conventional application software that evolves over a series of planned, chronologically-spaced releases, Web applications evolve continuously.

Immediacy

The compelling need to get software to market quickly is a characteristic of many application domains. WebApps often exhibit a time to market that can be a matter of a few days or weeks.

Security

Because WebApps are available via network access, it is difficult, if not impossible, to limit the population of end-users who may access the application.

Aesthetics

An undeniable part of the appeal of a WebApp is its look and feel.

MOBILE APPS

Reside on mobile platforms such as cell phones or tablets

Contain user interfaces that take both device characteristics and location attributes

Often provide access to a combination of web-based resources and local device processing and storage capabilities

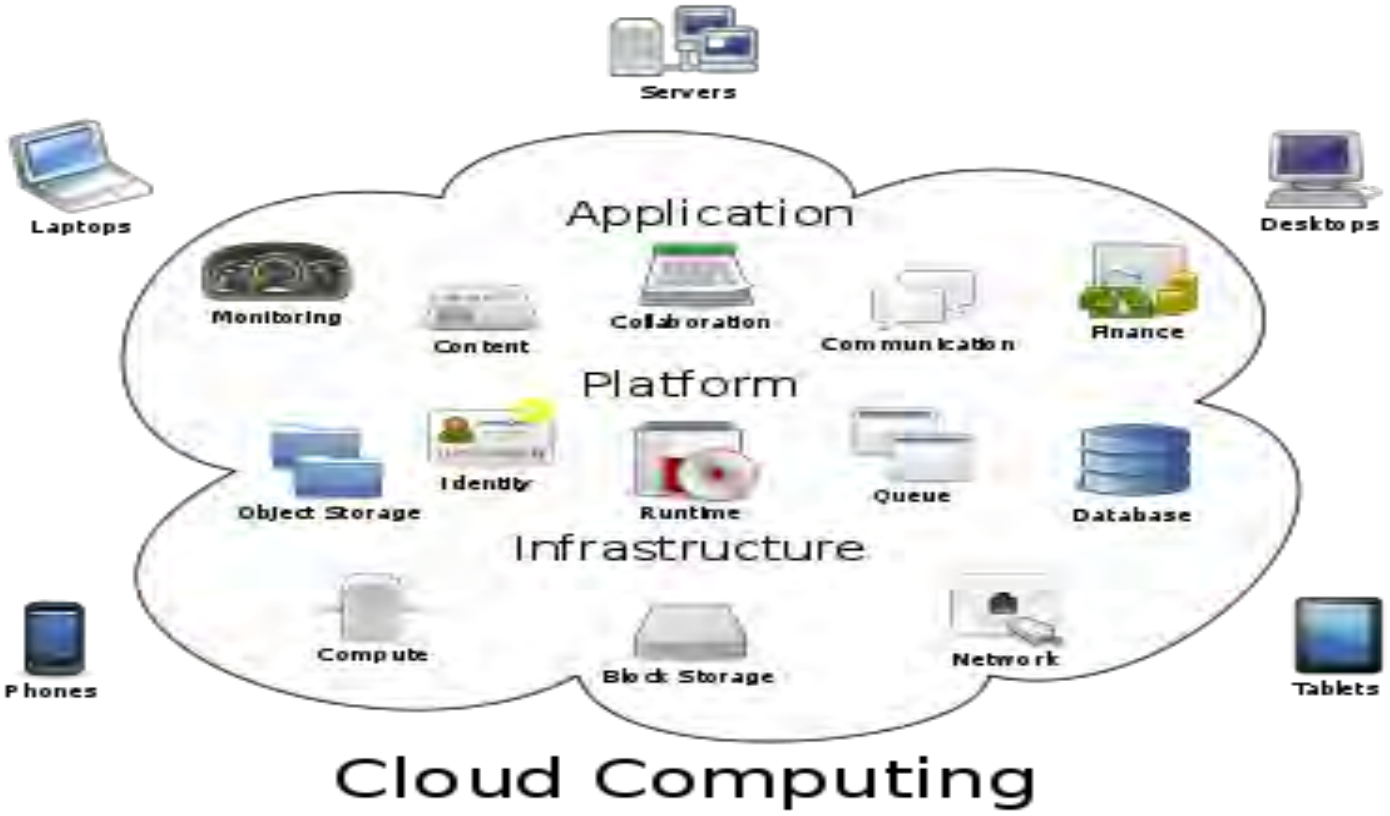
Provide persistent storage capabilities within the platform

A mobile web application allows a mobile device to access to web-based content using a browser designed to accommodate the strengths and weaknesses of the mobile platform

A mobile app can gain direct access to the hardware found on the device to provide local processing and storage capabilities

As time passes these differences will become blurred

CLOUD COMPUTING



CLOUD COMPUTING

- Provides distributed data storage and processing resources to networked computing devices
- Computing resources reside outside the cloud and have access to a variety of resources inside the cloud
- Requires developing an architecture containing both frontend and backend services
- Frontend services include the client devices and application software to allow access
- Backend services include servers, data storage, and server-resident applications
- Cloud architectures can be segmented to restrict access to private data

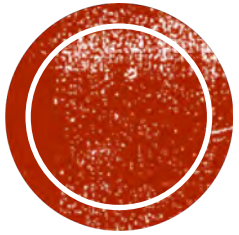
PRODUCT LINE SOFTWARE

A set of software-intensive systems that share a common set of features and satisfy the needs of a particular market

These software products are developed using the same application and data architectures using a common core of reusable software components

A software product line shares a set of assets that include requirements, architecture, design patterns, reusable components, test cases, and other work products

A software product line allow in the development of many products that are engineered by capitalizing on the commonality among all products with in the product lin



SOFTWARE ENGINEERING

SOFTWARE ENGINEERING

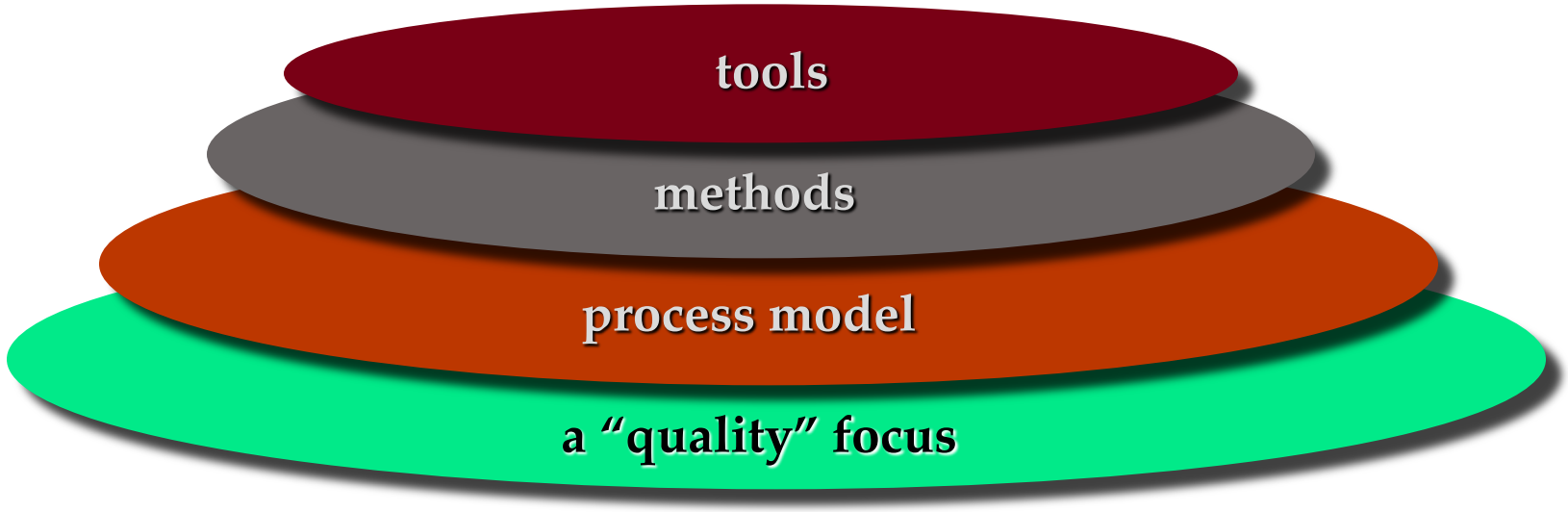
Some realities:

- a concerted effort should be made to understand the problem before a software solution is developed
- design becomes a pivotal activity
- software should exhibit high quality
- software should be maintainable

Definition:

- Seminal: The establishment and use of sound engineering principles in order to obtain economically software that is reliable and works efficiently on real machines.
- IEEE: The application of a systematic, disciplined, quantifiable approach to the development, operation, and maintenance of software; that is, the application of engineering to software.

A LAYERED TECHNOLOGY



Software Engineering

A PROCESS FRAMEWORK

- Process framework
  - Framework activities
  - Umbrella activities

FRAMEWORK ACTIVITIES

Communication

Planning

Modeling

Analysis of requirements

Design

Construction

Code generation

Testing

Deployment

UMBRELLA ACTIVITIES

Project tracking and control

Risk management

Quality assurance

Technical reviews

Measurement

Configuration management

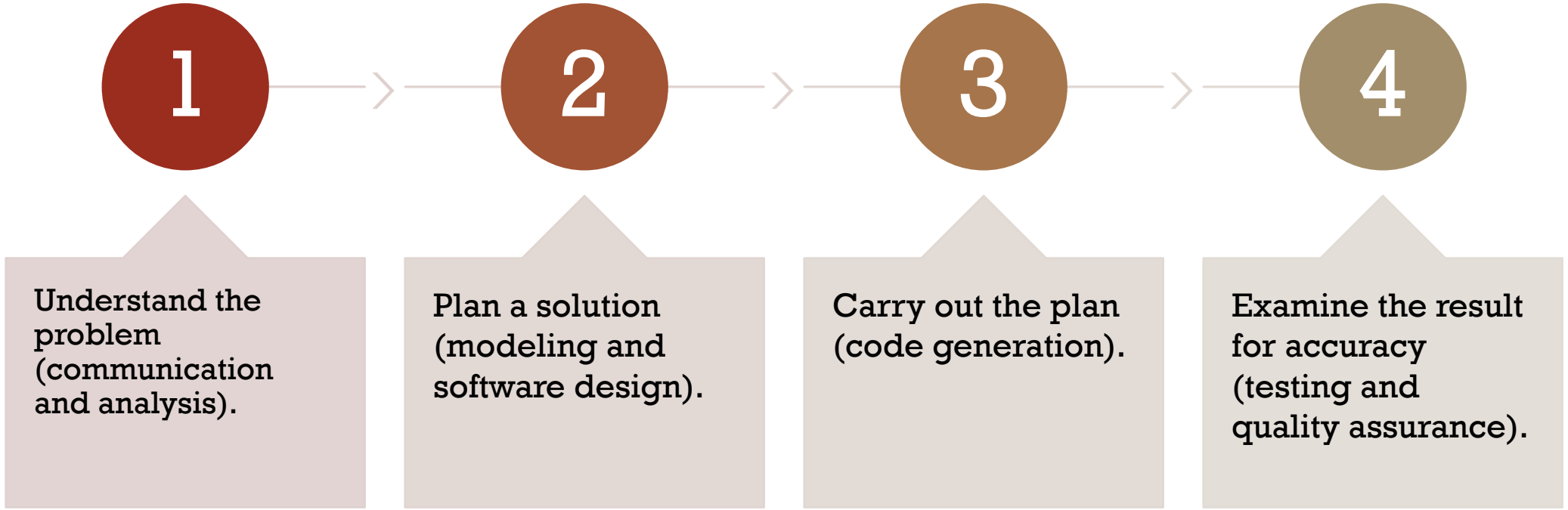
Reusability management

Work product preparation and production

ADAPTING A PROCESS MODEL

- the overall flow of activities, actions, and tasks and the interdependencies among them
- the degree to which actions and tasks are defined within each framework activity
- the degree to which work products are identified and required
- the manner which quality assurance activities are applied
- the manner in which project tracking and control activities are applied
- the overall degree of detail and rigor with which the process is described
- the degree to which the customer and other stakeholders are involved with the project
- the level of autonomy given to the software team
- the degree to which team organization and roles are prescribed

THE ESSENCE OF PRACTICE



UNDERSTAND THE PROBLEM

Who has a stake in the solution to the problem?

That is, who are the stakeholders?

What are the unknowns?

What data, functions, and features are required to properly solve the problem?

Can the problem be compartmentalized?

Is it possible to represent smaller problems that may be easier to understand?

Can the problem be represented graphically?

Can an analysis model be created?

PLAN THE SOLUTION

- Have you seen similar problems before?
- Are there patterns that are recognizable in a potential solution?
- Is there existing software that implements the data, functions, and features that are required?
- Has a similar problem been solved? If so, are elements of the solution reusable?
- Can subproblems be defined? If so, are solutions readily apparent for the subproblems?
- Can you represent a solution in a manner that leads to effective implementation?
- Can a design model be created?

CARRY OUT THE PLAN

Does the solution conform to the plan?

Is source code traceable to the design model?

Is each component part of the solution provably correct?

Has the design and code been reviewed, or better, have correctness proofs been applied to algorithm?

EXAMINE THE RESULT

Is it possible to test each component part of the solution?

Has a reasonable testing strategy been implemented?

Does the solution produce results that conform to the data, functions, and features that are required?

Has the software been validated against all stakeholder requirements?

HOOKER'S GENERAL PRINCIPLES

- The Reason It All Exists
- KISS (Keep It Simple, Stupid!)
- Maintain the Vision
- What You Produce, Others Will Consume
- Be Open to the Future
- Plan Ahead for Reuse
- Think!

SOFTWARE MYTHS

Affect managers, customers (and other non-technical stakeholders) and practitioners

Are believable because they often have elements of truth,

but …

Invariably lead to bad decisions,

therefore …

Insist on reality as you navigate your way through software engineering

HOW IT ALL STARTS

- Every software project is precipitated by some business need—
  - the need to correct a defect in an existing application;
  - the need to the need to adapt a ‘legacy system’ to a changing business environment;
  - the need to extend the functions and features of an existing application, or
  - the need to create a new product, service, or system.

REFERENCE

- Roger Pressman, Software Engineering: A Practitioner's Approach, 8th edition, McGraw Hill, ISBN 0078022126