

Chapter 1

Software and Software Engineering

- Dual role of software
- Software questions haven't changed
- A definition of software
- Differences between hardware and software
- Changing nature of software
- Dealing with legacy software
- Software myths

Dual Role of Software

- Both a product and a vehicle for delivering a product
 - Product
 - Delivers computing potential
 - Produces, manages, acquires, modifies, display, or transmits information
 - Vehicle
 - Supports or directly provides system functionality
 - Controls other programs (e.g., operating systems)
 - Effects communications (e.g., networking software)
 - Helps build other software (e.g., software tools)

Questions About Software Haven't Changed Over the Decades

- 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?

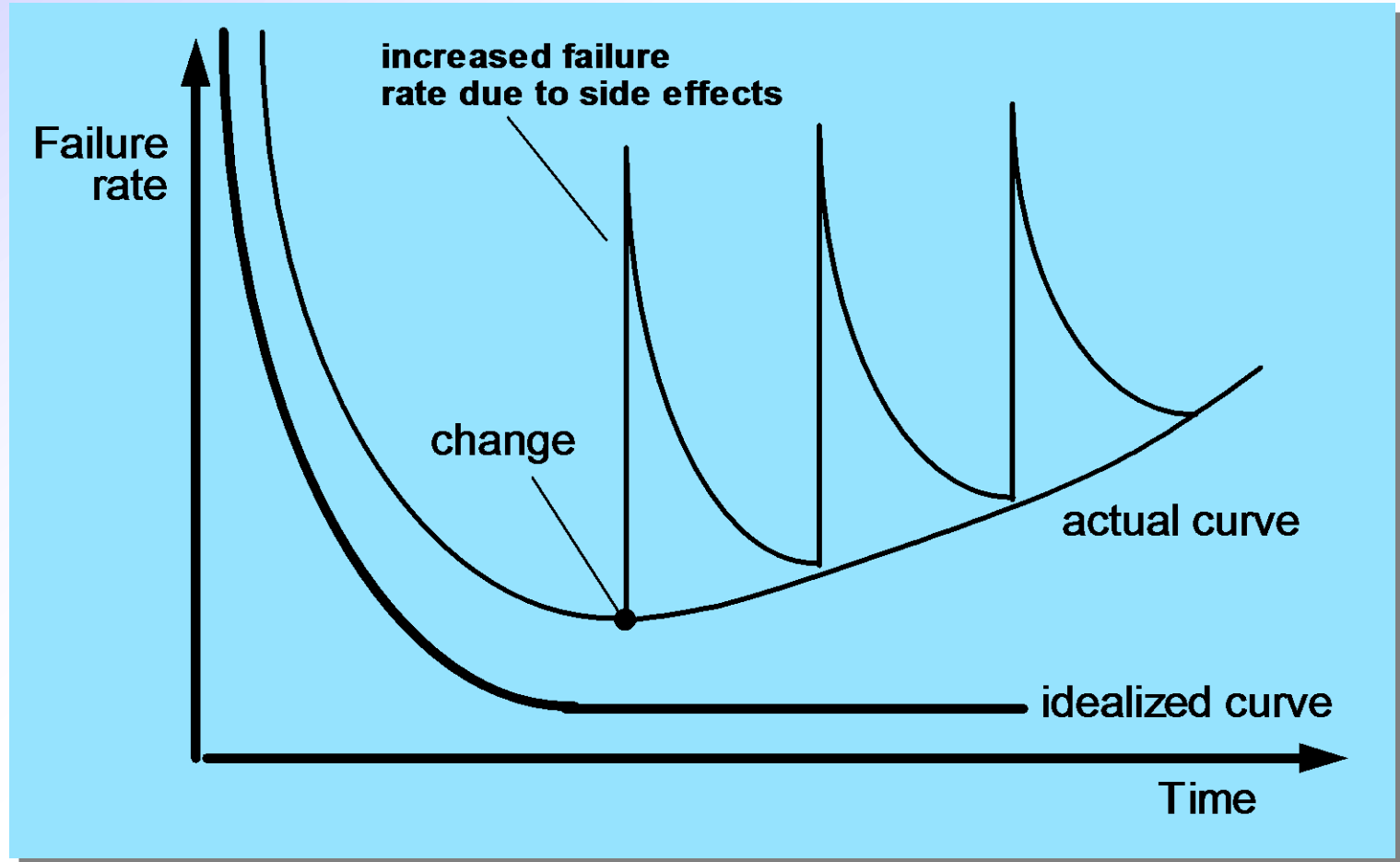
A Definition of Software (all inclusive)

- **Instructions** (computer programs) that when executed provide desired features, function, and performance
- **Data structures** that enable the programs to adequately manipulate information
- **Documents** that describe the operation and use of the programs

Differences between Software and Hardware

- Software is developed or engineered; it is not manufactured in the classical sense
 - Impacts the management of software projects
- Software doesn't wear out
 - Hardware bathtub curve compared to the software ascending spiked curve
- Although the industry is moving toward component-based construction, most software continues to be custom built (it is still complex to build)

Software Failure Curve



Changing Nature of Software

- System software
- Application software
- Engineering/scientific software
- Embedded software
- Product-line software (e.g., inventory control, word processing, multimedia)
- Web applications
- Artificial intelligence software
- Ubiquitous computing (small, wireless devices)
- Netsourcing (net-wide computing)
- Open source (operating systems, databases, development environments)
- The ".com" marketing applications

Legacy Software - Characteristics

- Support core business functions
- Have longevity and business criticality
- Exhibit poor quality
 - Convoluted code, poor documentation, poor testing, poor change management

Reasons for Evolving the Legacy Software

- (Adaptive) Must be adapted to meet the needs of new computing environments or more modern systems, databases, or networks
- (Perfective) Must be enhanced to implement new business requirements
- (Corrective) Must be changed because of errors found in the specification, design, or implementation

(Note: These are also the three major reasons for any software maintenance)

Software Myths - Management

- "We already have a book that is full of standards and procedures for building software. Won't that provide my people with everything they need to know?"
 - Not used, not up to date, not complete, not focused on quality, time, and money
- "If we get behind, we can add more programmers and catch up"
 - Adding people to a late software project makes it later
 - Training time, increased communication lines
- "If I decide to outsource the software project to a third party, I can just relax and let that firm build it"
 - Software projects need to be controlled and managed

Software Myths - Customer

- "A general statement of objectives is sufficient to begin writing programs – we can fill in the details later"
 - Ambiguous statement of objectives spells disaster
- "Project requirements continually change, but change can be easily accommodated because software is flexible"
 - Impact of change depends on where and when it occurs in the software life cycle (requirements analysis, design, code, test)

Software Myths - Practitioner

- "Once we write the program and get it to work, our job is done"
 - 60% to 80% of all effort expended on software occurs after it is delivered
- "Until I get the program running, I have no way of assessing its quality"
 - Formal technical reviews of requirements analysis documents, design documents, and source code (more effective than actual testing)
- "The only deliverable work product for a successful project is the working program"
 - Software, documentation, test drivers, test results
- "Software engineering will make us create voluminous and unnecessary documentation and will invariably slow us down"
 - Creates quality, not documents; quality reduces rework and provides software on time and within the budget

