

Chapter 1

- OS/w characteristics
- ② S/w Application
- ③ S/w : risks on the horizon

Software

Software is

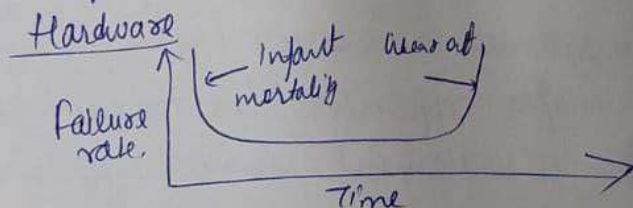
- ① instructions that when executed provide desired function and performance
- ② data structures that enable the programs to adequately manipulate information
- ③ documents that describe the operation and use of programs.

Characteristics

- ① Software is developed or engineered, it is not manufactured in the classical sense. Diff. b/w manufactured vs software development
In manufacturing, the design and production phases are distinct, with the production phase involving mass replication of final design.
In software development, production phase has minimal cost & effort focus on continuous design & improvement.

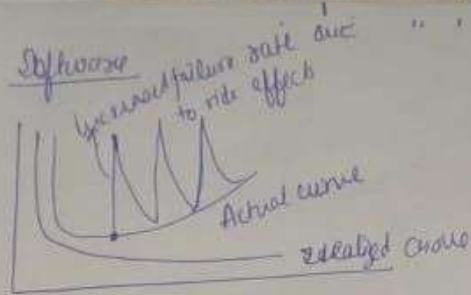
Repetition → manufac. involves repetitive steps to produce the same product over and over again. Software development is more about creating things almost new, with each product being different for each customer

- ② Software doesn't "wear out."



Bathtub curve.

It indicates the hardware exhibits relatively high-failure rates early in its life; defects are ~~corrects~~ corrected and the failure rate drops to a steady-state level for some period of time. At the time passes, the failure rate rises again due to some factors which mean hardware begins to wear out.



It doesn't wear out. During its life, software will undergo change (maintenance). As changes are made, it is likely that some new defects will be introduced, causing the failure rate to spike. Usually, the min. failure rate level begins to rise.

Diff. b/w hardware & software. When a hardware component wears out, it is replaced by a spare part. Every software failure indicates an error in design or in the process through which design was translated into machine-executable code. Software ~~complexity~~ involves more complexity than hardware maintenance.

③ Although the industry is moving toward component-based assembly, most software continues to be custom built.

⇒ In hardware design, engineers use standardized, reusable components like ICs to streamline the process, focusing on innovative elements of the design.

Similarly, software development has gradually embraced reuse, where components encapsulate both data & processing to be used across various applications. Early software reuse began with subroutine libraries for scientific applications, but today it extends to complex components or a UI element, enabling efficiency.

Software Applications

① System software: → ① System software is a collection of programs written to service other programs.

- ② It is characterized by
- (i) heavy interaction with computer hardware
 - (ii) heavy usage by multiple users

- (iii) concurrent operation that requires scheduling,
- (iv) resource sharing and sophisticated process management
- (v) complex data structures
- (vi) multiple external interfaces

Real-time software

① Software that monitors/analyzes/controls real-world events as they occur is called real time.

② Elements of real-time software include a

(i) data-gathering component → collects & formats info from an external environment.

(ii) analysis component → transforms info as required by the application.

(iii) control/output component → responds to the external environment.

(iv) monitoring component → coordinates all other components so that real-time response can be maintained.

Business Software

① Discrete "systems" have evolved into management info. system softwares that access one or large databases containing business information.

② Applications in this area restructure existing data in a way that facilitates business operations or management decision making.

Engineering & scientific softwares

① Engineering & scientific softwares have been characterized by "number crunching" algorithms.

② Applications range from astronomy to volcanology, from automotive stress analysis to space shuttle orbital dynamics and from molecular biology to automated manufacturing.

Embedded software

① Embedded software resides in read-only memory and is used to control products and systems for the consumer and industrial markets.

② Embedded software can perform very limited and ~~not~~ esoteric fun (e.g. Keyboard control for a microwave oven).

(3) response

or provide significant funⁿ & control capability

Personal Computer Software

The personal computer software market Applications - word processing, spreadsheets, computer graphics, multimedia, entertainment, database management, personal and business financial applications -

Web-based software

The web pages retrieved by a browser are software that incorporates executable instructions (e.g. html) and data (e.g. hypertext).

Artificial Intelligence Software

AI software makes use of non-numerical algo to solve complex problems that are not amenable to computation or straightforward analysis

Software Crisis

The term "software crisis" once described significant challenges in software development, but experts like ~~Robert~~ Robert Glass now see it as a chronic issue rather than a crisis. While early concerns predicted major failures, the industry has seen more successes than failures. The real issue is a persistent set of problems in software development, maintenance, and scaling to meet growing demand. These problems continue to affect the industry, though it remains successful despite them. Finding a broad solution could greatly improve software development processes.