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المحاضرة الاولى

Software engineering

المادة : Software engineering
المرحلة : الثالثة
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Introduction

What difference between Software(S/W) and Software engineering (S.E)?

Software (s/w): is a computer program which may be applied in any situation for specified set of procedural steps has been defined (e.g. algorithm).

A simple def. is: Software program = data structures + algorithms

Software engineering (S.E):

A simple def. is:

Software engineering = data structures + algorithms +documentation.

There are several definitions of **Software engineering** as follows:

First: Software engineering refers to a systematic procedure that is used in the context of a generally accepted set of goals for the analysis, design, implementation, testing and maintenance of software.

Second: S.E is an outgrowth of H.W and system engineering. It encompasses a set of three key elements: ***methods***, ***tools*** and ***procedures*** that enables the manager to control the process of s/w development and provide high quality software in a productive manner.

- ***Methods:*** consist of system and software requirements, planning, design of data structure and algorithm procedure, coding, testing and maintenance.
- ***Tools:*** used to implements each one of the previous methods.
- ***Procedures:*** used to define the implementation sequence for both methods and tools.

Third: S.E is the practical application of scientific knowledge in the design and construction of computer programs and the associated documentation required to develop, operate and maintain them.

What is Software engineering?

- Software engineering is concerned with theories, methods, and tools which are needed to develop a good ***software product***.
- The objective of S.E is to produce a high quality software products with a finite amount of resources and to predicated schedule.

Software products: are software systems which delivered to a customer with the documentation that describes how to install and use the system. Software products may be developed for a particular customer or may be developed for a general market.

There are two kinds of Software products:

1. Generic products:

- Stand-alone systems that are marketed and sold to any customer who wishes to buy them.

Examples – *PC software such as editing, graphics programs, project management tools; CAD software_ software for specific markets such as appointments systems for dentists.*

2. Customized products:

- Software that is commissioned by a specific customer to meet their own needs.

Examples – *embedded control systems, air traffic control software, traffic monitoring systems.*

Software Applications:

1. **System software:** such as compilers, editors, file management utilities
2. **Application software:** stand-alone programs for specific needs.
3. **Engineering/scientific software:** such as automotive stress analysis, molecular biology, orbital dynamics etc.
4. **Embedded software** resides within a product or system. (key pad control of a microwave oven, digital function of dashboard display in a car)
5. **Product-line software** focus on a limited marketplace to address mass consumer market. (word processing, graphics, database management)
6. **WebApps** (Web applications) network centric software. As web 2.0 emerges, more sophisticated computing environments is supported integrated with remote database and business applications.
7. **AI software** uses non-numerical algorithm to solve complex problem. Robotics, expert system, pattern recognition game playing.

Software—New Categories

- **Open world computing**— distributed computing due to wireless networking. (How to allow mobile devices, personal computer, enterprise system to communicate across vast network).

- **Net sourcing**—the Web as a computing engine. How to architect simple and sophisticated applications to target end-users worldwide.

- **Open source**—"free" source code open to the computing community. Software for: Data mining, Grid computing, Cognitive machines and nanotechnologies.

Why Software is Important?

- The economies of ALL developed nations are dependent on software.
- More and more systems are software controlled (transportation, medical, telecommunications, military, industrial, entertainment,)
- Software engineering is concerned with theories, methods and tools for professional software development.

Goals of software engineering are :

1- Low cost of production.
2- High performance.
3- Portability.
4- High reliability.
5- Low cost of maintenance.
6- Delivery on time.

Essential attributes of well- engineering software

Product characteristic	Description
1- Maintainability	Software should be written in such a way so that it can evolve to meet the changing needs of customers. This is a critical attribute because software change is an inevitable requirement of a changing business environment.
2- Dependability & Security	Software dependability includes a range of characteristics including reliability, security and safety. Dependable software should not cause physical or economic damage in the event of system failure. Malicious users should not be able to accessor damage the system.
3- Efficiency	Software should not make wasteful use of system resources such as memory and processor cycles. Efficiency therefore includes responsiveness, processing time, memory utilisation, etc.
4- Acceptability	Software must be acceptable to the type of users for which it is designed. This means that it must be understandable, usable and compatible with other systems that they use.

What are the costs of software engineering?

- Software is the most expensive component of many computer-based systems, a reliable approach to cost estimation is important for the continued success of a S/w development organization.

- Roughly 60% of costs are development costs, 40% are testing costs.

- Costs vary depending on:

(1) the type of system being developed
(2) the requirements of system attributes such as performance and systemreliability.

- Distribution of costs depends on the development model that is used.

What are software engineering methods?

- Structured approach to software development which includes: system models,notation, rules, design advice, and process guidance.

- **Module descriptions:** Graphical models that should be produced.
- **Rules:** Constraints applied to system models.
- **Recommendations:** Advice on good design practice.
- **Process guidance:** What activities to follow and how to do so.