Software and Software Engineering

Any computer-based system consists of:

1- Software.
2- Hardware.
3- Human.
4- Database.
5- Documents.

What is Software?

computer software or just software is a general term used to describe a collection of computer programs, procedures, and documentation that perform some tasks on a computer system.

Another definition of software is that it consists of:

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- Documents descriptive information in both hard copy and virtual forms that describes the operation and use of the programs.

Who does it?

Individuals and teams do software engineering work. In some cases, one person has much of the responsibility, but in most industry-grade software efforts, a team of people does the work.

Why is it important?

Software engineering is important because it enables us to build complex systems in a timely manner and with high quality. It affects nearly every aspect of our lives and our everyday activities.

Software is a logical rather than a physical system element. Therefore, the software has characteristics that are considerably different than those of hardware:

1. Software is developed or engineered; it is not manufactured in the classical sense.
2. Software doesn't "wear out" but it does deteriorate due to change.
3. When a hardware component wears out, it is replaced by a spare part. There are no software spare parts.
4. Although the industry is moving toward component-based construction, most software continues to be custom-built.

Software engineering:

The *IEEE* has developed the following definition for software engineering: The application of a systematic, disciplined, quantifiable approach to the development, operation, and maintenance of software; that is, the application of engineering to software.

The difference between software engineering and computer science

Computer science focuses on theory and fundamentals; software engineering is concerned with the practicalities of developing and delivering useful software.

The difference between software engineering and system engineering

System engineering is concerned with all aspects of computer-based systems development including hardware, software, and process engineering. Software engineering is part of this more general process.

Who is a good software engineer?

The following attributes should possess:

1- Exposure to systematic techniques, which means he is familiar with software engineering principles.
2- Good technical knowledge of the project areas (Domain knowledge)
3- Good programming abilities.
4- Good communication skills. These skills comprise oral, written, and interpersonal skills.
5- High motivation.
6- Sound knowledge of fundamentals of computer science.
7- Intelligence.
8- Ability to work in a team.
9- Discipline.

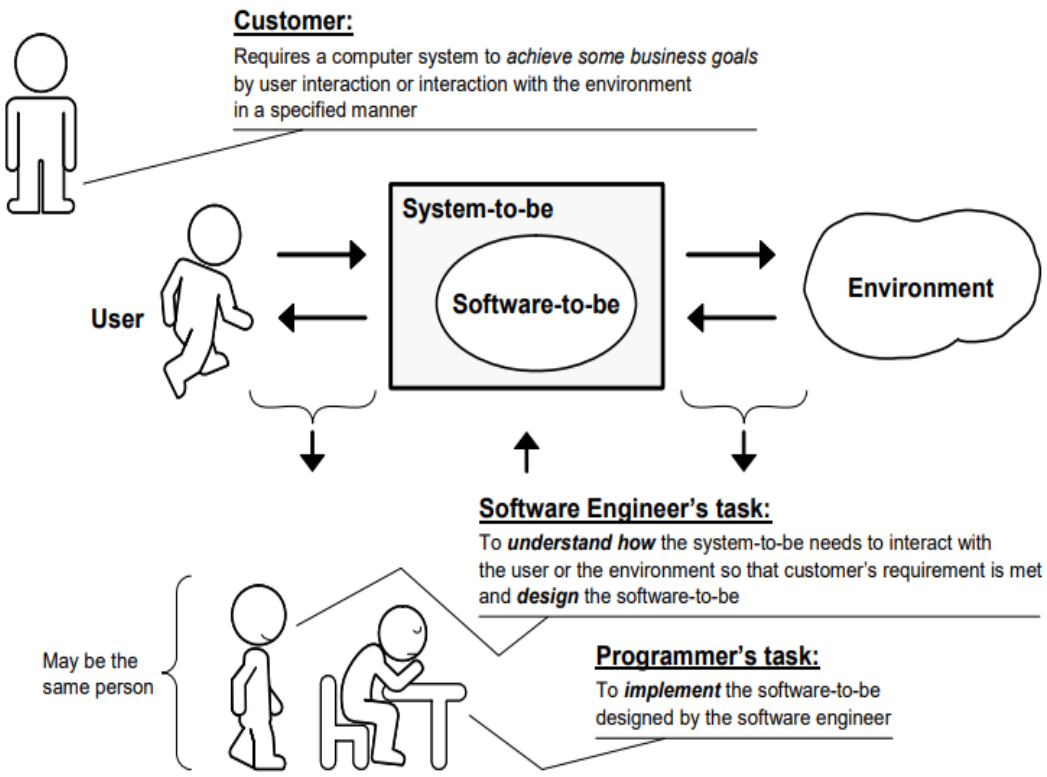

Figure 1.1: The role of software engineering.

Are software teams really necessary?

Some information appears to suggest that teams of software engineers are not necessary for some systems that are larger than the typical smartphone application. For example, the initial version of the MS-DOS operating system was developed by two people of Microsoft. As well as the UNIX operating system was also developed by two people.

However, times have changed considerably, it is important to understand the distinction between initial prototype versions of software, which are

often by very small groups of people, and commercial software, which requires much larger organizational structures. Clearly, even software that was originally developed by one or two people is now developed by teams in order to increase the number of available features and to improve usability for a wide class of users.

So, how large should such a software team be? The most important factor seems to be the size of the project, with the capability of the team members, schedule, and methodology also important.

Nowadays, Modern teams may be highly distributed, and this is where social networking tools (e.g., Facebook, LinkedIn, Twitter) allow degrees of connections among team members.