

## Unit – I

Definition of Software Engineering, Software Development Life Cycle (SDLC) – Phases, Traditional vs Agile Models (Waterfall, Agile, DevOps), Scrum Basics – Roles, Sprint, Backlog, Version Control using Git and GitHub, Introduction to Project Tools (GitHub Projects, Jira, Trello).

### **Software Process: Process and project**

#### **Process:**

A process is the sequence of steps executed to achieve a goal. A process is defined by cycles. Similar to a project, a process also has a beginning, middle, and end; however, this cycle repeats itself over an average period of time.

#### **Definition:**

The term **software engineering** is the product of two words, **software**, and **engineering**.

#### **Software:**

The **software** is a collection of integrated programs. Software subsists of carefully-organized instructions and code written by developers on any of various particular computer languages. Computer programs and related documentation such as requirements, design models and user manuals.

#### **Engineering:**

Engineering is the application of scientific and practical knowledge to invent, design, build, maintain, and improve frameworks, processes, etc.

#### **Software Engineering:**

Software Engineering is a systematic, disciplined, and quantifiable approach to the development, operation, and maintenance of software systems. It applies engineering principles to software development to ensure reliable, efficient, and maintainable software products.

#### **Project:**

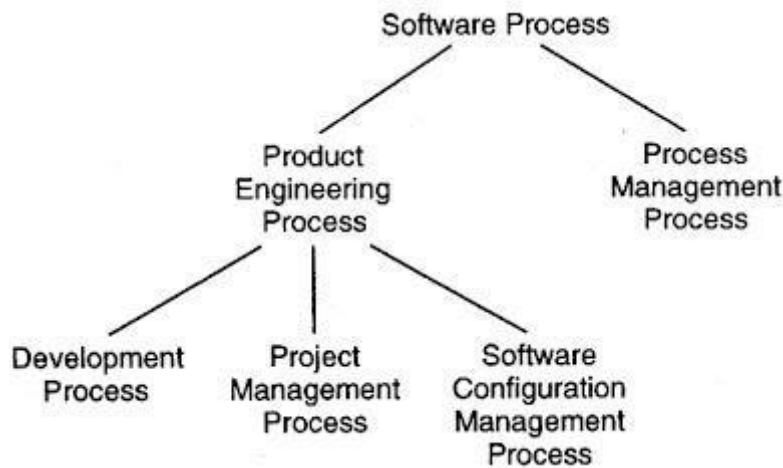
A project is defined by a fixed time, scope, and resources. When implementing a project, the goal is to execute change, usually drastic, and to incorporate that change into the day-to-day processes of the company. Both projects and process are important for running and improving a business. However, depending on the end result

trying to be achieved, one may be more suited than the other.

### **1. Component software process:**

- The processes that deal with the technical and management issues of software development are collectively called the software process.
- As a software project will have to engineer a solution and properly manage the project, there are clearly two major components in a software process—a development process and a project management process.
- The development process specifies all the engineering activities that need to be performed, whereas the management process specifies how to plan and control these activities so that cost, schedule, quality, and other objectives are met.
- Effective development and project management processes are the key to achieving the objectives of delivering the desired software satisfying the user needs, while ensuring high productivity and quality.
- As development processes generally do not focus on evolution and changes, to handle them another process called software configuration control process is often used. The objective of this component process is to primarily deal with managing change, so that the integrity of the products is not violated despite changes.
- product engineering processes, their main objective is to produce the desired product.
- The basic objective of the process management process is to improve the software process. By improvement, we mean that the capability of the process to produce quality goods at low cost is improved. For this, the current software process is studied, frequently by studying the projects that have been done using the process. The whole process of understanding the current process, analyzing its properties, determining how to improve, and then affecting the improvement is dealt with by the process management process.
- The relationship between these major component processes is shown in Figure 2.2. These component processes are distinct not only in the type of activities performed in them, but typically also in the people who perform the activities specified by the process.

In a typical project, development activities are performed by programmers, designers, testers, etc.; the project management process activities are performed by the project management; configuration control process activities are performed by a group

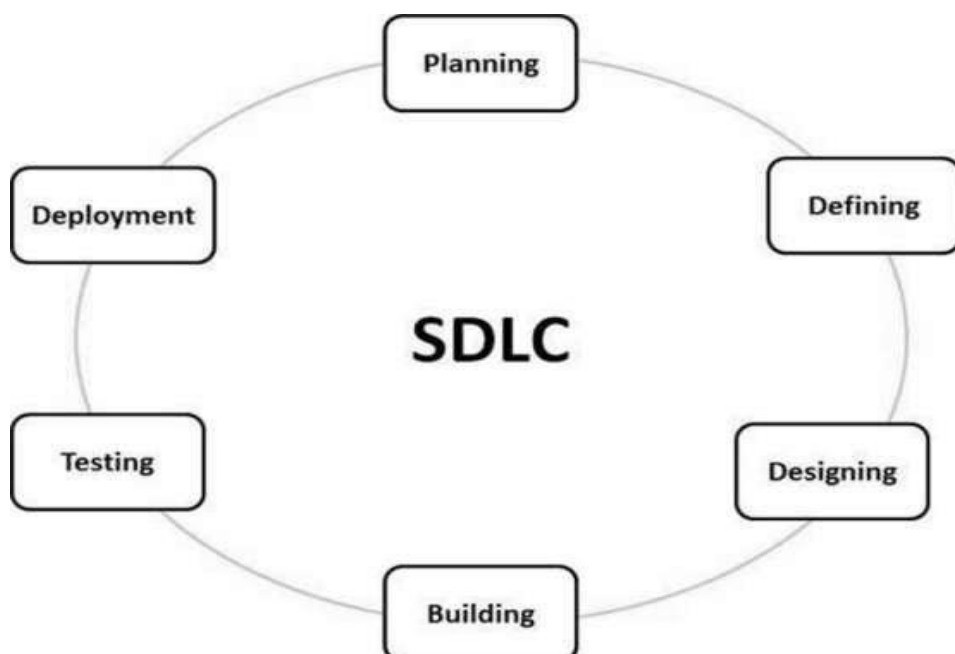


generally called the configuration controller; and the process management process activities are performed by the software engineering process group (SEPG).

### **Software development process models:**

#### **What is SDLC?**

SDLC is a process followed for a software project, within a software organization. It consists of a detailed plan describing how to develop, maintain, replace and alter or enhance specific software. The life cycle defines a methodology for improving the quality of software and the overall development process.



A typical Software Development Life Cycle consists of the following stages :

### **Stage 1: Planning and Requirement Analysis**

Requirement analysis is the most important and fundamental stage in SDLC. It is performed by the senior members of the team with inputs from the customer, the sales department, market surveys and domain experts in the industry. This information is then used to plan the basic project approach and to conduct product feasibility study in the economical, operational and technical areas. Planning for the quality assurance requirements and identification of the risks associated with the project is also done in the planning stage. The outcome of the technical feasibility study is to define the various technical approaches that can be followed to implement the project successfully with minimum risks.

### **Stage 2: Defining Requirements**

Once the requirement analysis is done the next step is to clearly define and document the product requirements and get them approved from the customer or the market analysts. This is done through an SRS (Software Requirement Specification) document which consists of all the product requirements to be designed and developed during the project life cycle.

### **Stage 3: Designing the Product Architecture**

SRS is the reference for product architects to come out with the best architecture for the product to be developed. Based on the requirements specified in SRS, usually more than one design approach for the product architecture is proposed and documented in a DDS - Design Document Specification.

This DDS is reviewed by all the important stakeholders and based on various parameters as risk assessment, product robustness, design modularity, budget and time constraints; the best design approach is selected for the product.

A design approach clearly defines all the architectural modules of the product along with its communication and data flow representation with the external and third party modules (if any). The internal design of all the modules of the proposed architecture should be clearly defined with the minutest of the details in DDS.

#### **Stage 4: Building or Developing the Product**

In this stage of SDLC the actual development starts and the product is built. The programming code is generated as per DDS during this stage. If the design is performed in a detailed and organized manner, code generation can be accomplished without much hassle.

Developers must follow the coding guidelines defined by their organization and programming tools like compilers, interpreters, debuggers, etc. are used to generate the code. Different high level programming languages such as C, C++, Pascal, Java and PHP are used for coding. The programming language is chosen with respect to the type of software being developed.

#### **Stage 5: Testing the Product**

This stage is usually a subset of all the stages as in the modern SDLC models, the testing activities are mostly involved in all the stages of SDLC. However, this stage refers to the testing only stage of the product where product defects are reported, tracked, fixed and retested, until the product reaches the quality standards defined in the SRS.

#### **Stage 6: Deployment in the Market and Maintenance**

Once the product is tested and ready to be deployed it is released formally in the appropriate market. Sometimes product deployment happens in stages as per the business strategy of that organization. The product may first be released in a limited segment and tested in the real business environment (UAT- User acceptance testing).

Then based on the feedback, the product may be released as it is or with suggested enhancements in the targeting market segment. After the product is released in the market, its maintenance is done for the existing customer base.