

Section -1

SDLC (Software Development Life Cycle)

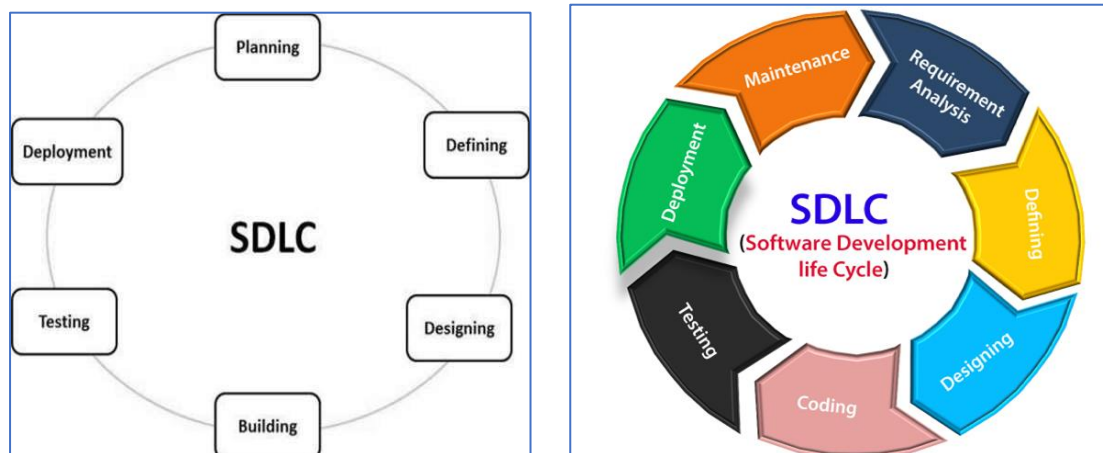
Software Development Life Cycle (SDLC) is a process used by the software industry to design, develop and test high quality software's. The SDLC aims to produce a high-quality software that meets or exceeds customer expectations, reaches completion within times and cost estimates.

- SDLC is the acronym of Software Development Life Cycle.
- It is also called as Software Development Process.
- SDLC is a framework defining tasks performed at each step in the software development process.

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.

The following figure is a graphical representation of the various stages of a typical SDLC.



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.

SDLC Models

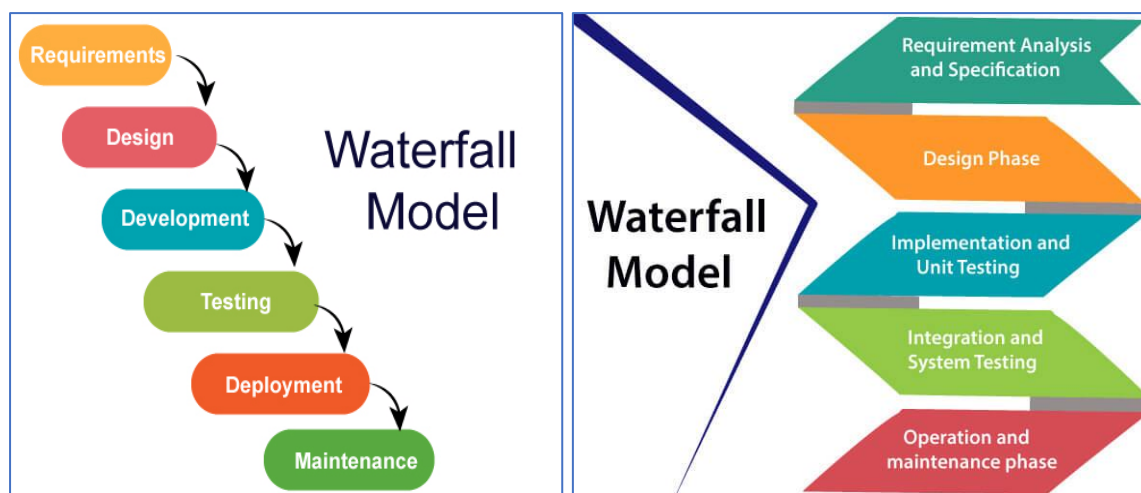
There are various software development life cycle models defined and designed which are followed during the software development process. These models are also referred as "Software Development Process Models". Each process model follows a Series of steps unique to its type to ensure success in the process of software development.

Following are the most important and popular SDLC models followed in the industry –

- Waterfall Model
- Iterative Model
- Spiral Model
- V-Model
- Big Bang Model

Other related methodologies are Agile Model, RAD Model, Rapid Application Development and Prototyping Models.

Waterfall model



Winston Royce introduced the Waterfall Model in 1970. This model has five phases: Requirements analysis and specification, design, implementation, and unit testing, integration and system testing, and operation and maintenance. The steps always follow in this order and do not overlap. The developer must complete every phase before the next phase begins. This model is named "**Waterfall Model**", because its diagrammatic representation resembles a cascade of waterfalls.

1. Requirements analysis and specification phase: The aim of this phase is to understand the exact requirements of the customer and to document them properly. Both the customer and the software developer work together so as to document all the functions, performance, and interfacing requirement of the software. It describes the "what" of the system to be produced

and not "how." In this phase, a large document called **Software Requirement Specification (SRS)** document is created which contained a detailed description of what the system will do in the common language.

2. Design Phase: This phase aims to transform the requirements gathered in the SRS into a suitable form which permits further coding in a programming language. It defines the overall software architecture together with high level and detailed design. All this work is documented as a Software Design Document (SDD).

3. Implementation and unit testing: During this phase, design is implemented. If the SDD is complete, the implementation or coding phase proceeds smoothly, because all the information needed by software developers is contained in the SDD.

During testing, the code is thoroughly examined and modified. Small modules are tested in isolation initially. After that these modules are tested by writing some overhead code to check the interaction between these modules and the flow of intermediate output.

4. Integration and System Testing: This phase is highly crucial as the quality of the end product is determined by the effectiveness of the testing carried out. The better output will lead to satisfied customers, lower maintenance costs, and accurate results. Unit testing determines the efficiency of individual modules. However, in this phase, the modules are tested for their interactions with each other and with the system.

5. Operation and maintenance phase: Maintenance is the task performed by every user once the software has been delivered to the customer, installed, and operational.

When to use SDLC Waterfall Model?

Some Circumstances where the use of the Waterfall model is most suited are:

- When the requirements are constant and not changed regularly.
- A project is short
- The situation is calm
- Where the tools and technology used is consistent and is not changing
- When resources are well prepared and are available to use.

Advantages of Waterfall model

- This model is simple to implement also the number of resources that are required for it is minimal.
- The requirements are simple and explicitly declared; they remain unchanged during the entire project development.

- The start and end points for each phase is fixed, which makes it easy to cover progress.
- The release date for the complete product, as well as its final cost, can be determined before development.
- It gives easy to control and clarity for the customer due to a strict reporting system.

Disadvantages of Waterfall model

- In this model, the risk factor is higher, so this model is not suitable for more significant and complex projects.
- This model cannot accept the changes in requirements during development.
- It becomes tough to go back to the phase. For example, if the application has now shifted to the coding phase, and there is a change in requirement, It becomes tough to go back and change it.
- Since the testing done at a later stage, it does not allow identifying the challenges and risks in the earlier phase, so the risk reduction strategy is difficult to prepare.