Software Development Life Cycle (SDLC)

CE418: Systems Analysis and Design

Maryam Ramezani
Sharif University of Technology
maryam.ramezani@sharif.edu

CMM (Capability Maturity Model)

Organizational Maturity

- Organizational maturity is the measure of the quality of a company's operations. A company with a high maturity level can face challenges and seize upon opportunities. Improving organizational maturity is a gradual process that emphasizes internally driven improvement.
- In an organization, there are six criteria for measuring organizational maturity:
  - Objective
  - Process
  - Awareness
  - Responsibility
  - Tools
  - Skill.

Organizational Maturity

- **Objective:** Refers to the clarity and specificity of the organization's goals. Are the objectives clearly defined, documented, and measurable?
  - Clear objectives provide direction for the organization and help employees understand what they are working towards. Without well-defined objectives, measuring success and progress becomes challenging.
- **Process:** This criterion refers to how tasks are performed and the structure of operations. Are the processes standardized, repeatable, and well-defined, or are they ad hoc and unstructured?
  - Well-documented and efficient processes enable the organization to operate systematically and continuously improve its performance. It reflects how well-organized and efficient the organization's operations are.

Organizational Maturity

- **Awareness:** Awareness assesses whether individuals within the organization are informed about its objectives, processes, and needs. Are they aware of their roles, responsibilities, and what is expected of them?
  - **Importance**: When employees and management are aware of the organization's goals and processes, they can work more effectively towards those objectives. This fosters synergy and more effective collaboration within the organization.
- **Responsibility:** This measures how clearly roles and responsibilities are assigned within the organization. Do individuals know what tasks they are responsible for, and are they held accountable for those tasks?
  - **Importance**: Clear delegation of responsibilities ensures that everyone understands their role, which increases transparency and productivity. Responsibility also fosters greater commitment and accountability in fulfilling tasks.

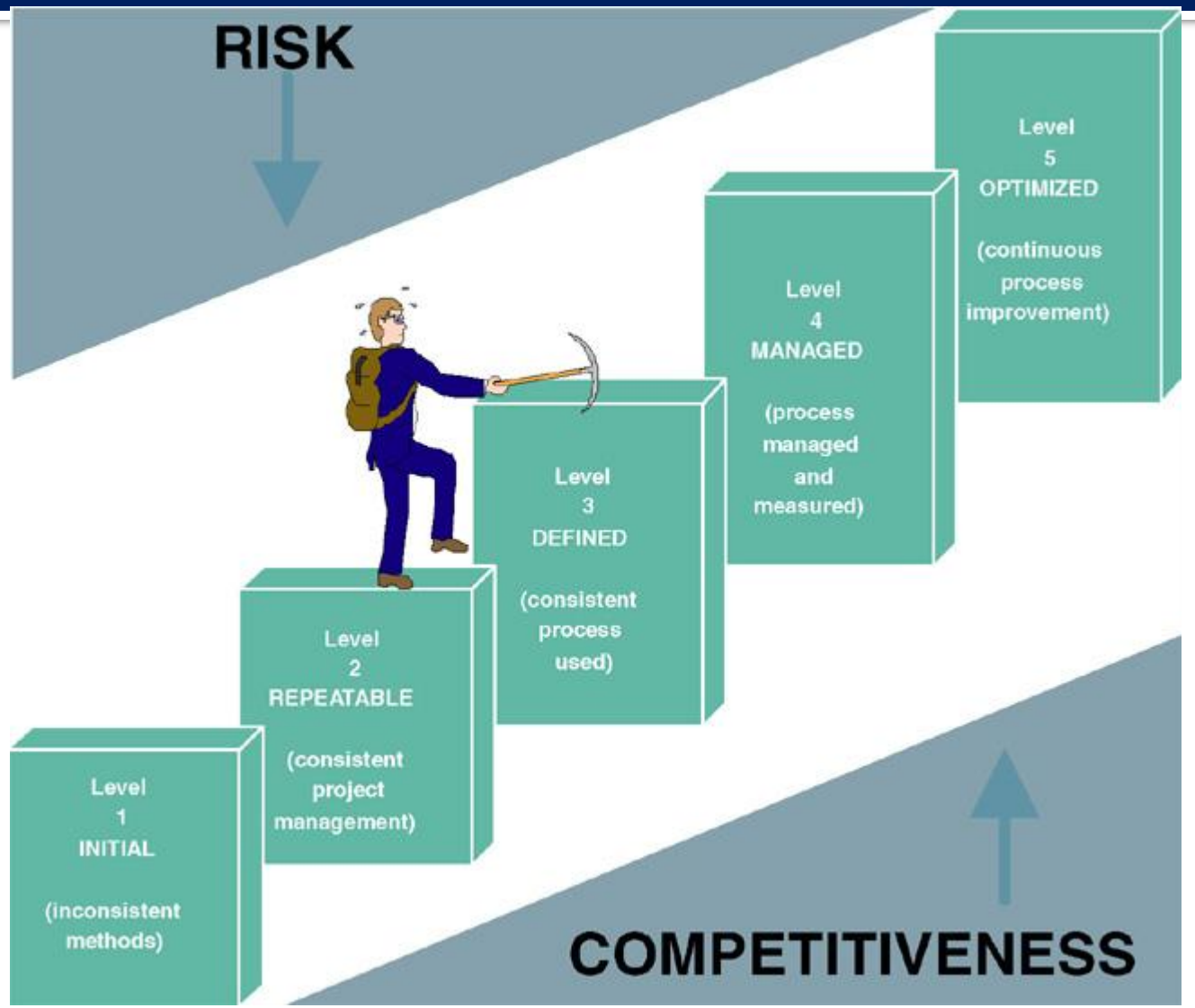
Organizational Maturity

- **Tools:** refer to the technologies, software, and equipment available to carry out tasks and achieve organizational goals. Does the organization have access to the right tools to work effectively?
  - **Importance**: Using the right tools enhances the speed, accuracy, and efficiency of operations. Organizations that leverage modern tools and technology tend to be more efficient and successful.
- **Skill:** refers to the knowledge and capabilities of the people in the organization. Do employees and managers possess the necessary skills to perform their tasks effectively?
  - **Importance**: A skilled workforce is crucial for the success of any organization. Having the right skills in place improves the quality and efficiency of processes and increases the organization's competitiveness.

Capability Maturity Model (CMM)

- The US Department of Defense (DoD) wanted to evaluate their contractors.
  - They needed a framework to evaluate the maturity of software processes.
  - In 1986, the Software Engineering Institute (SEI) initiated the development of a framework to be called the CMM.
- In the CMM model, the maturity level of an organization tells us to what extent an organization can produce low cost, high quality software.
- Having known the current maturity level, an organization can work to reach the next higher level.
  - There are *five* maturity levels in the CMM model.

Capability Maturity Model (CMM)



CMM-Level 1

Capability Maturity Model (CMM) – a standardized framework for assessing the maturity level of an organization's information system development and management processes and products. It consists of five levels of maturity:

- Level 1—Initial: System development projects follow no prescribed process. Processes unpredictable. Poor controlled and reactive.

CMM-Level 2

- Level 2—Repeatable: Project management processes and practices established to track project costs, schedules, and functionality. Processes characterized for projects and is often reactive.
  - No documentation and no view on future.
  - At this stage, the goals of the processes are limited to a department or business unit, and there is usually very little or no executive support.

CMM-Level 3

- Level 3—Defined: Standard system development process (methodology) is purchased or developed. All projects use a version of this process.

CMM-Level 4

- Level 4—Managed: Measurable goals for quality and productivity are established. KPI: Key Performance Indicator.

CMM-Level 5

- Level 5—Optimizing: The standardized system development process is continuously monitored and improved based on measures and data analysis established in Level 4.

Key Process Areas (KPA)

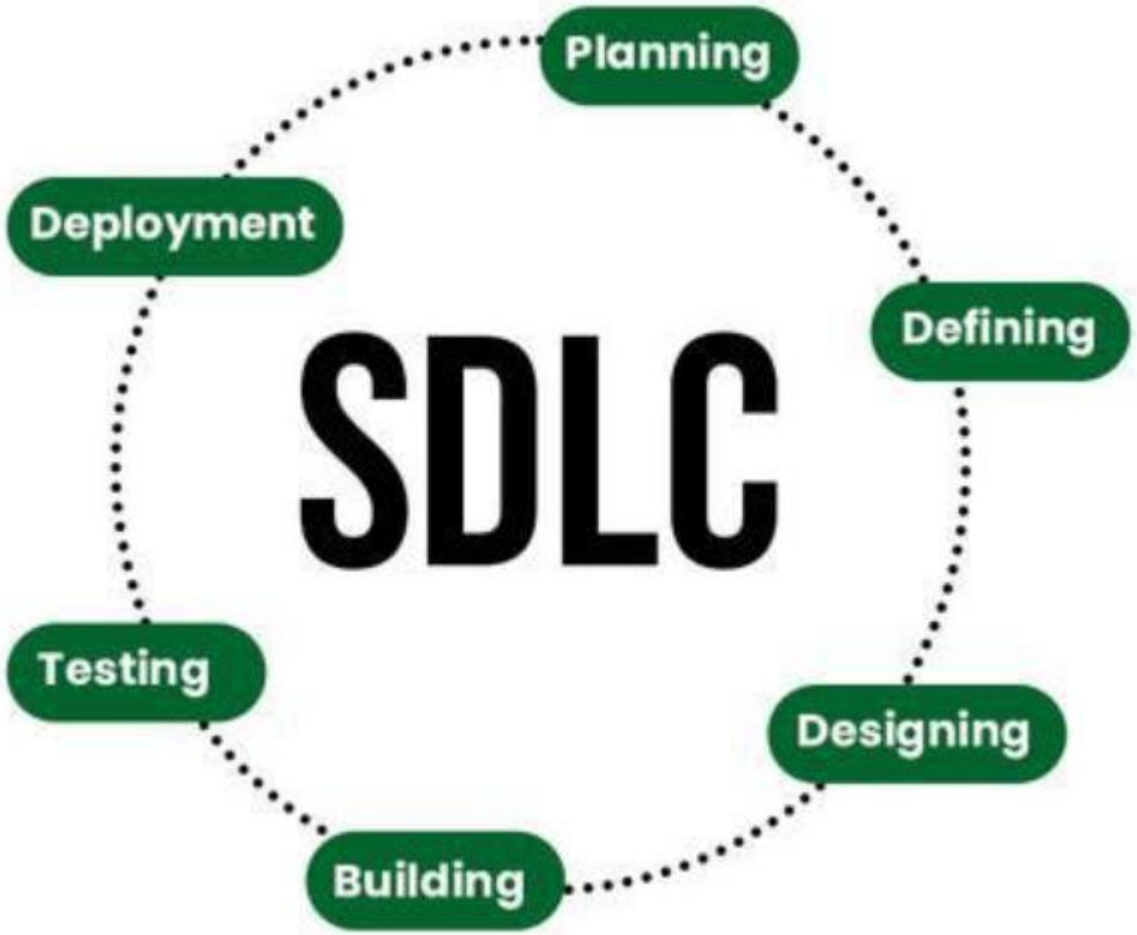
- To achieve a specific level of maturity, the organization must demonstrate that it addresses all the key process areas defined for that level.
  - There are no key process areas for Level 1
  - KPA Level 2: Basic software project management practice
  - KPA Level 3: Infrastructure for single software life cycle model
  - KPA Level 4: Quantitative understanding of process and deliverables
  - KPA Level 5: Keep track of technology and process changes

Software Development Life Cycle

Development Methodology

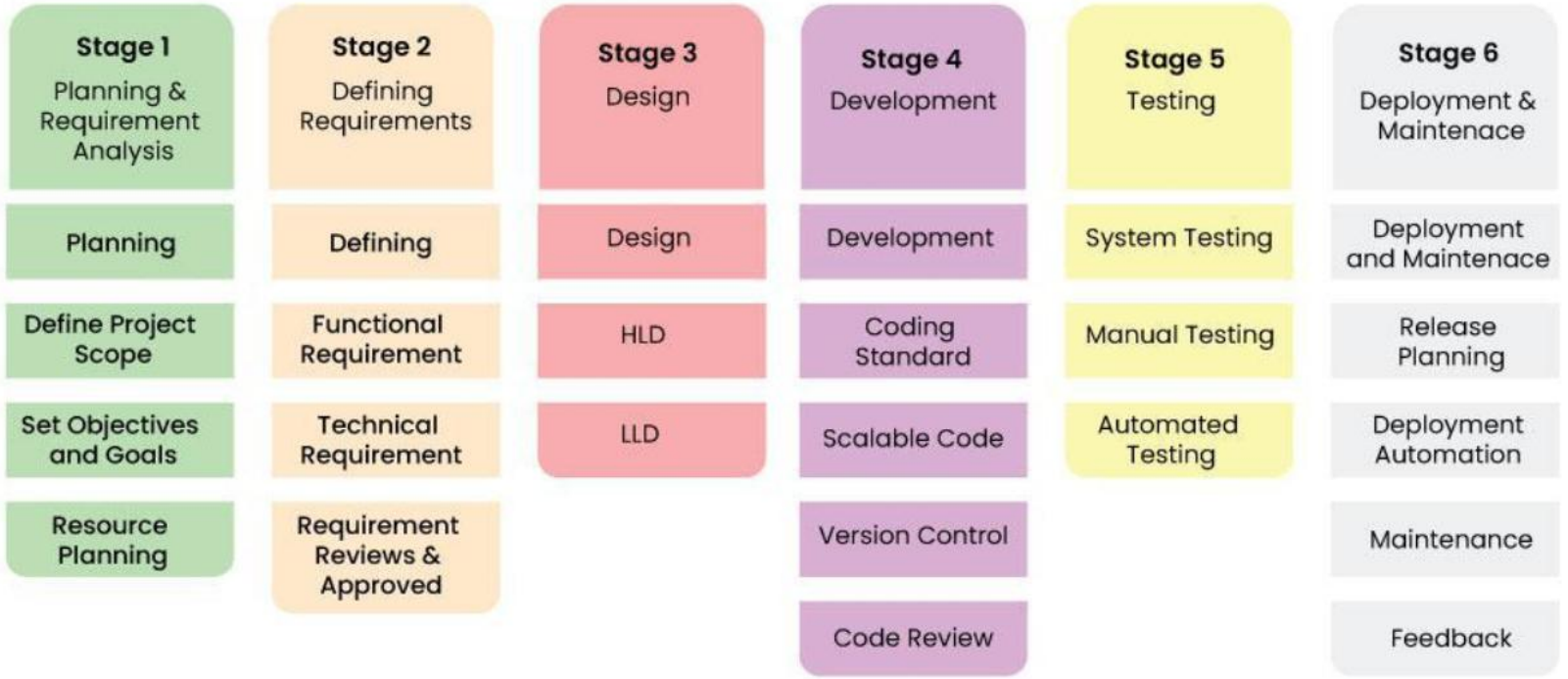
- A Formalized approach to the systems development process;
- A standardized development process that defines (**as in CMM Level 3**) a set of
  - → activities,
  - → methods,
  - → best practices,
  - → deliverables, and
  - → automated tools
- System developers and *project managers* are to use to *develop* and continuously *improve* information systems and software.
- SDLC Model (Software Development Life Cycle): A framework that describes the activities performed at each stage of a software development project.

SDLC


Planning
Defining
Designing
Building
Testing
Deployment
SDLC

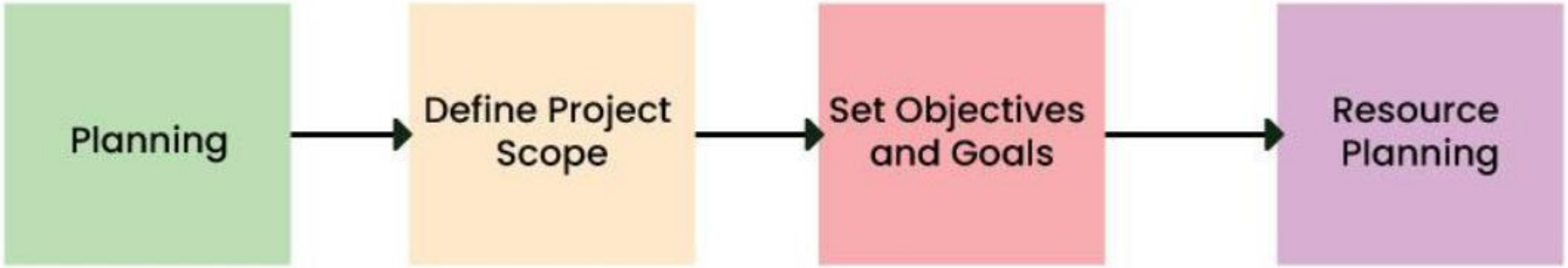
Stages of the SDLC

- SDLC specifies the tasks to be performed at various stages by a software engineer or developer. It ensures that the end product is able to meet the customer's expectations and fits within the overall budget.



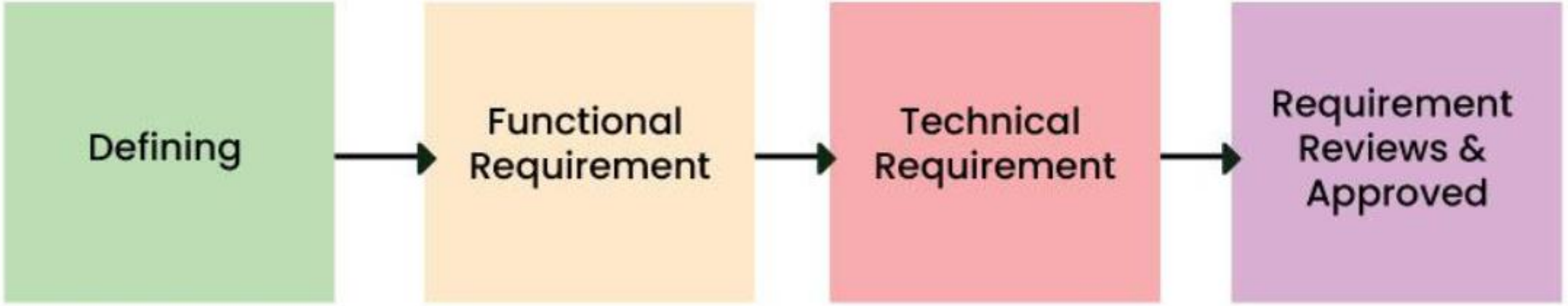
Stage 1: Planning and Requirement Analysis

- Requirement is attained from customer inputs, and sales department/market surveys.



Stage 2: Defining Requirements

- In this stage, all the requirements for the target software are specified. These requirements get approval from customers, market analysts, and stakeholders.
- This is fulfilled by utilizing SRS (Software Requirement Specification). This is a sort of document that specifies all those things that need to be defined and created during the entire project cycle.

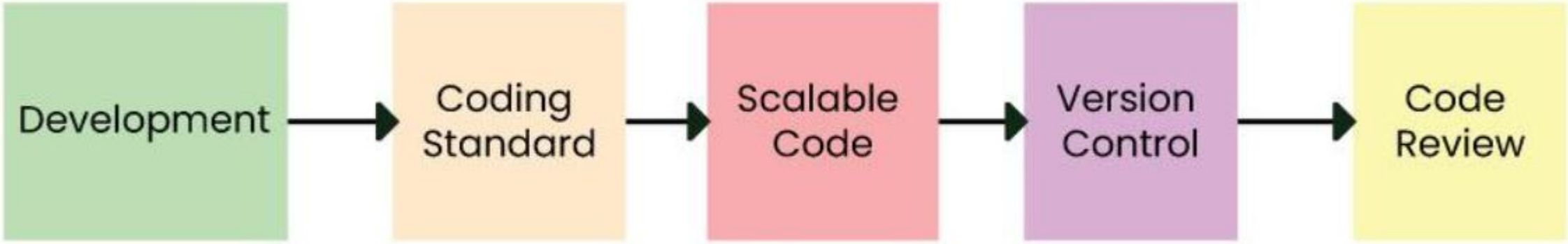


Stage 3: Designing Architecture

- SRS is a reference for software designers to come up with the best architecture for the software. Hence, with the requirements defined in SRS, multiple designs for the product architecture are present in the Design Document Specification (DDS).
- This DDS is assessed by market analysts and stakeholders. After evaluating all the possible factors, the most practical and logical design is chosen for development.

Stage 4: Developing Product

- At this stage, the fundamental development of the product starts. For this, developers use a specific programming code as per the design in the DDS. Hence, it is important for the coders to follow the protocols set by the association. Conventional programming tools like compilers, interpreters, debuggers, etc. are also put into use at this stage. Some popular languages like C/C++, Python, Java, etc. are put into use as per the software regulations.

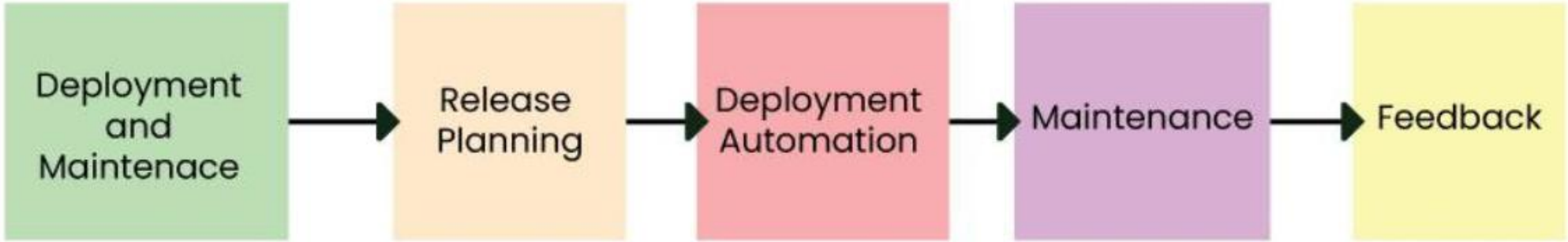


Stage 5: Product Testing and Integration

- After the development of the product, testing of the software is necessary to ensure its smooth execution. Although, minimal testing is conducted at every stage of SDLC. Therefore, at this stage, all the probable flaws are tracked, fixed, and retested. This ensures that the product confronts the quality requirements of SRS.

Stage 6: Deployment and Maintenance of Products

- After detailed testing, the conclusive product is released in phases as per the organization's strategy. Then it is tested in a real industrial environment. It is important to ensure its smooth performance. If it performs well, the organization sends out the product as a whole. After retrieving beneficial feedback, the company releases it as it is or with auxiliary improvements to make it further helpful for the customers.



Methods for implementing the SDLC

- Structured
- Rapid Application Development (RAD)
- Agile Development

Any Question?