Software Construction & Development

Assignment 01 (SCD-001)

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Uses of Process Models

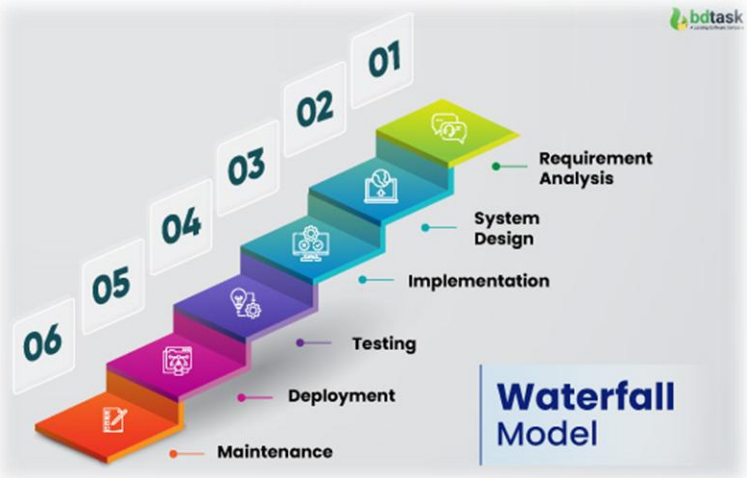
First, we shall discuss the uses of different process models and how they are used in terms of the whole software engineering domain.

Following are the process models that we are going to target here:

- Waterfall Process Model
- Incremental Process Model
- Spiral Process Model
- Iterative Model
- Agile Process Model
- Incremental Process Model
- Scrum Process Model

Waterfall Process Model

This is a process model used in the field of Software engineering when a project is being developed and set up for being brought up to the market for commercial and public use by the people.



This process model is typically applied in the following domains:

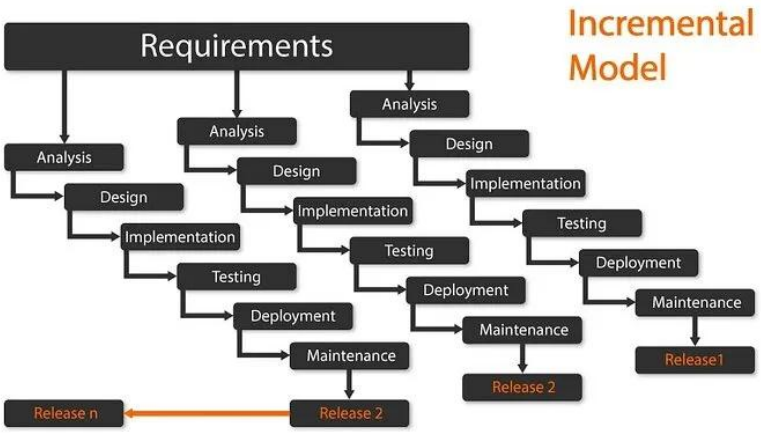
- Government or Defense projects
- Banking & Financial systems
- Embedded systems & hardware-software integration
- Academic or student projects

Now the question arises that why is this process model used, here are some of the answers to this question:

- Requirements are stable and well-understood from the start
- Stakeholders demand detailed documentation & predictable timelines.
- Risk of change in this is high which means one small change in the 06 phase sequential phase ends with high cost of do-overs and then more money invested which sometimes isn't what the client or stakeholder wants.

Incremental Process Model

This is also a process model which is used for an incremental approach to the software development phase which consists of the following steps as shown below in the diagrammatic representation.



This process model is used in the following domain areas:

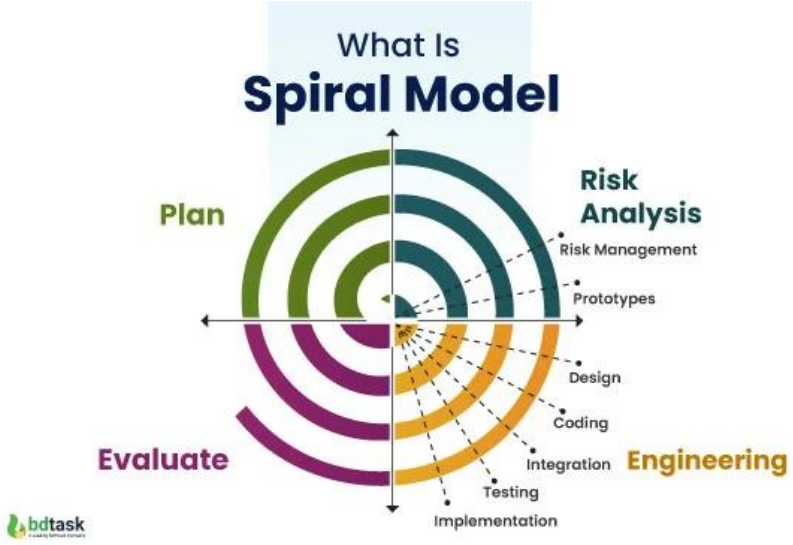
- Startups & Evolving products where the features are added based on the user feedback given to the development team
- Web & mobile apps where the frequent updates or modular features are used time to time
- Academic & Student projects where students build their project in phases
- Social impact tools where the scope of the project or application might change time to time as their policy and vision updates

This process model is used because of the following reasons in a software development environment:

- Early delivery of core features
- Easier testing and debugging
- Flexibility to adapt
- Risk reduction
- Parallel development
- Customer engagement

Spiral Process Model

This is also another software development process model used for various projects and clients. A diagrammatic representation of this is shown below:



As you can see from the picture above, we have the sequential process of how the spiral process model is used in the field of software development.

Here are some of the areas or domains where this process model is used:

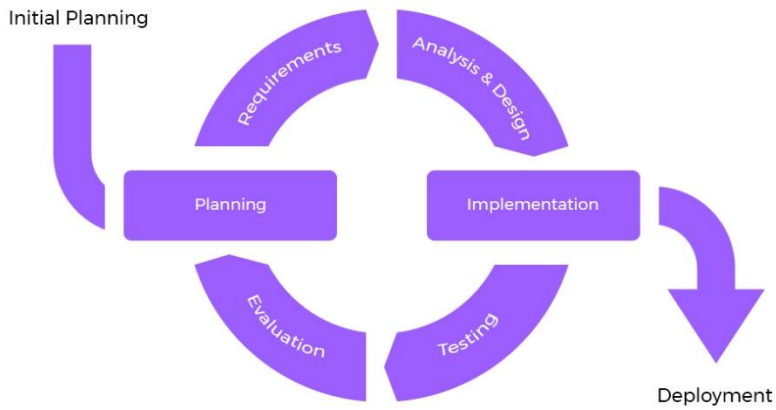
- Larger-scale, high-budget projects
- Projects with unclear or evolving requirements
- Systems requiring frequent risk assessment & prototyping
- Long-term academic or research-based software

Here are some reasons of why this process model is used:

- Risk management built-in
- Flexibility with changing requirements
- Prototyping before full commitment
- Scalable for large, complex systems

Iterative Process Model

This is also another software development process used by most software engineers or software houses. The working of this software process model has been shown below in the diagram.



As you can see in this diagram that we have the following steps of how the iterative software process models work in software development with each step described in it.

This process model is used in the following areas or domains by the project team:

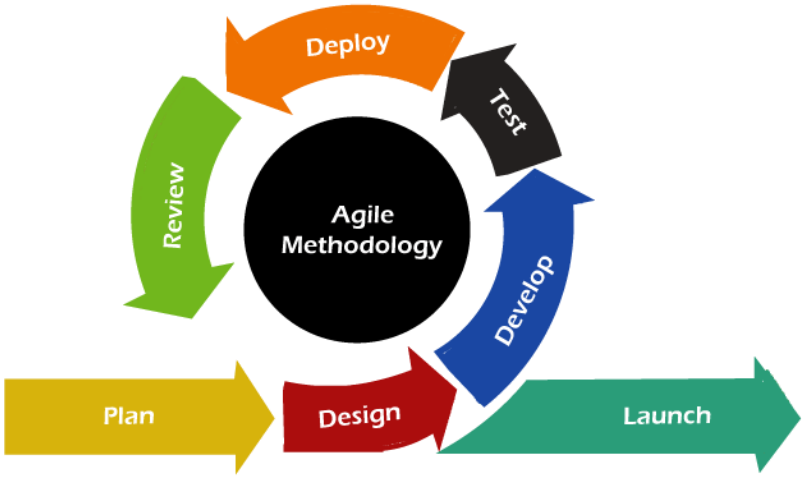
- Web & mobile app development
- Startups and MVP's (Minimum Viable Product)
- Academic & Final Year Projects
- NGO or social impact tools
- Enterprise level systems

Now we shall why is it used in these domains:

- Early delivery of value
- Flexibility with requirements
- Simplified testing & debugging
- Risk management
- Parallel development
- Customer engagement

Agile Process Model

This is another software process model used in software development. We shall see of how is it used through a diagrammatic representation of the process model as shown below.



Now we shall where this software process model is used and which domains does it cover shown below:

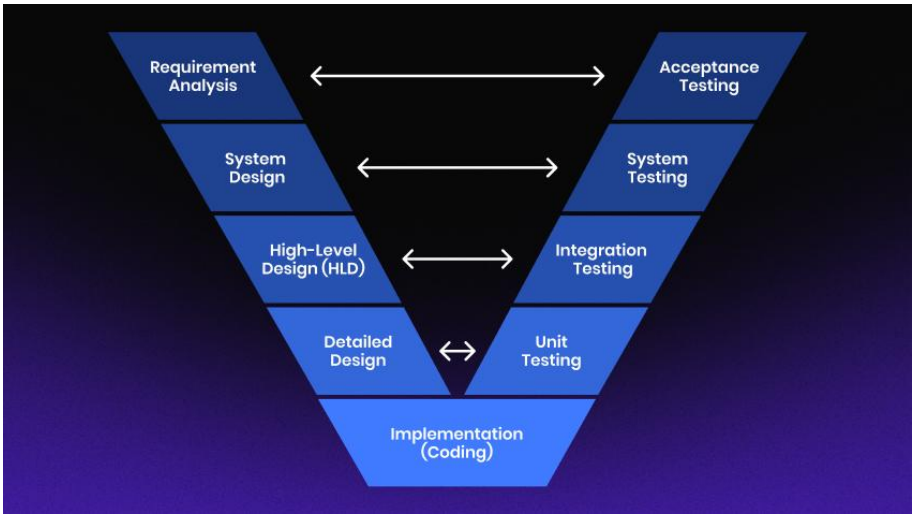
- Startups & tech companies
- Web & mobile apps
- Academic & student projects
- UI/UX heavy systems

Now we shall why this process model is used in the software development process:

- Embraces change
- Improves collaboration
- Delivers early value & changes in the system

V & V Process Model

This is another software process model known as the Validation & Verification software process model. The question to how it is used is answered below in the diagrammatic representation of its steps and processes.



Now we shall where this process model is used and which domains:

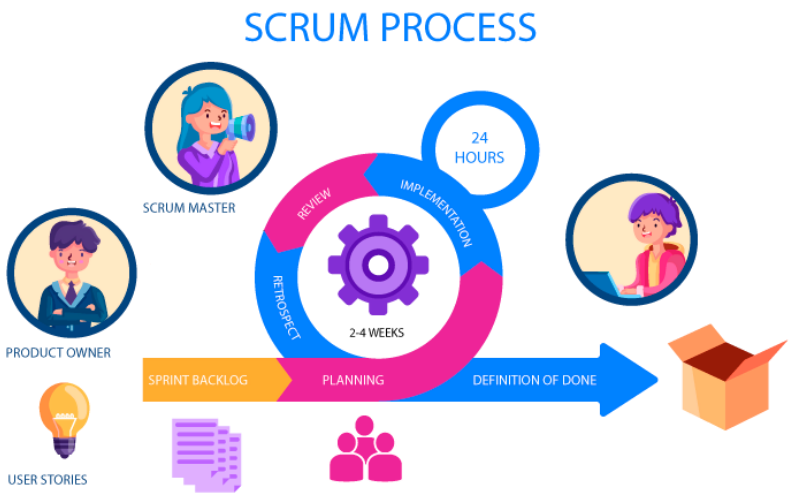
- Healthcare & medical software
- Aerospace & defense
- Banking & financial systems
- Automative embedded systems
- Scientific & research software
- Enterprise level software with long lifecycles

Now we shall see the why of this process model that why is it used in the software development process:

- Risk reduction
- Requirement traceability
- Early test planning
- Quality assurance
- User satisfaction
- Scalable & maintainable

Scrum Process Model

This is another software process model which is used in the software development phase in software houses & agencies. The answer to how it is used is explained in the diagram shown below illustrating the steps of the Scrum process model.



Now we are going to see where this process model is used:

- Web apps, mobile apps, SaaS platforms
- MVP Development
- Marketing & content teams
- Game development
- Construction & engineering

Now we shall see why this process model is used:

- Iterative delivery
- Flexibility
- Continuous feedback
- Team empowerment
- Transparency & visibility

Advantages of Process Models

Here we shall the advantages each software process models carries with it shown below:

Waterfall Process Model

The waterfall model has the following advantages:

- Simple & easy to understand
- Clear documentation & phase separation
- Ideal for projects with fixed requirements

It has the following dis-advantages:

- No flexibility for changes once development starts
- Late testing phase may delay bug discovery
- Not suitable for complex or evolving projects

Incremental Process Model

The incremental process model has the following advantages:

- Delivers working software early
- Easier to test & debug smaller modules
- Flexible to changing requirements

It has the following dis-advantages:

- Requires good planning & modular design
- Integration can become complex over time
- Not ideal for systems with tightly coupled components

Spiral Process Model

The spiral process model has the following advantages:

- Excellent for risk management
- Combines iterative development with systematic planning
- Suitable for large, high-risk projects

It has the following dis-advantages:

- Complex & costly to manage
- Requires expertise in risk analysis
- Not ideal for small or low budget projects

Iterative Process Model

The iterative process model has the following advantages:

- Allows early feedback & refinement
- Reduces risk of failure by building it in cycles
- Easier to adapt to changing requirements

It has the following dis-advantages:

- Requires strong version control & planning
- May lead to scope creep if its not managed well
- Initial iterations may lack full functionality as time passes

Agile Process Model

The Agile process model has the following advantages:

- Highly flexible & adaptive
- Continuous delivery of value
- Strong customer collaboration & feedback

It has the following dis-advantages:

- Requires experienced & disciplined teams
- Less emphasis on documentation
- Can be chaotic without proper structure

V & V Process Model

The V&V process model has the following advantages:

- Strong focus on testing & quality
- Clear mapping between development & testing phases
- Ideal for projects with strict validation needs

It has the following dis-advantages:

- Rigid structure- no room for changes
- Testing only begins after coding
- Not suitable for evolving projects

Scrum Process Model

It has the following advantages:

- Fast delivery through short sprints
- Encourages team collaboration & ownership
- Adapts quickly to changing priorities

It has the following disadvantages:

- Requires high team discipline and commitment
- Scope can shift rapidly without control
- Not ideal for projects needing heavy documentation upfront