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COLLEGE OF ENGINEERING

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SOFTWARE COMPONENT DESIGN

Agile Model

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The Agile Model

In earlier days, the **Iterative Waterfall Model** was widely adopted for project completion. However, developers encountered significant challenges, particularly when addressing **customer change requests** during project development. Incorporating changes proved both time-consuming and expensive, which hindered progress. To overcome these limitations, the **Agile Software Development Model** emerged in the mid-1990s. Agile introduced a more flexible and adaptive approach, focusing on incremental delivery, collaboration, and rapid response to change.

The Agile Model is a modern software development methodology that emphasizes **iterative development**, continuous collaboration, flexibility, and customer satisfaction. Unlike traditional methods such as Waterfall, Agile breaks the project into smaller, manageable cycles called **iterations or sprints**. Each sprint delivers a functional part of the product, enabling continuous feedback and adaptation. This iterative approach ensures that the evolving requirements of the customer are met effectively, resulting in a product that aligns closely with their expectations.

Agile SDLC Models/Methods

Agile encompasses various models or methods that implement its principles. The most popular Agile frameworks include:

- ✓ **Scrum** – Focuses on short sprints, daily stand-ups, and delivering incremental progress.
- ✓ **Kanban** – Visual workflow management system to limit work-in-progress and improve efficiency.
- ✓ **Extreme Programming (XP)** – Emphasizes coding standards, test-driven development, and continuous feedback.
- ✓ **Lean Development** – Reduces waste and focuses on delivering maximum value to the customer.
- ✓ **Feature-Driven Development (FDD)** – Breaks projects into features that can be developed in short cycles.

Steps in the Agile Model

The Agile Model follows a structured process to deliver software in an incremental and iterative manner. It breaks the project into smaller, manageable steps to ensure collaboration, adaptability, and continuous delivery. Each step focuses on a specific phase of the development cycle, ensuring the end product meets customer requirements effectively.

Below is a visual representation of the Agile steps to provide clarity and highlight the iterative nature of the process.

Fig:- Steps in Agile SDLC Model
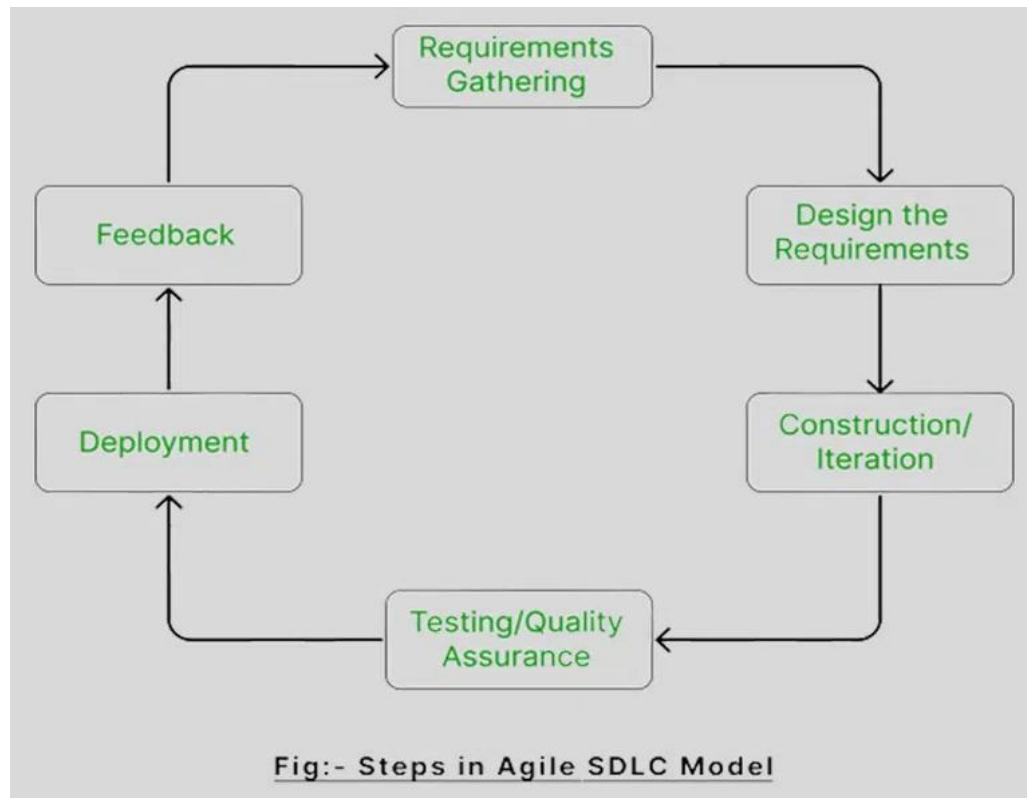
✓ **Requirement Gathering**: Collect and prioritize customer requirements to define the scope of the project.
✓ **Design the Requirements**: Create initial design plans, focusing on functional and non-functional specifications.
✓ **Construction / Iteration**: Develop the software in iterative cycles (sprints) with continuous coding, testing, and adjustments.
✓ **Testing / Quality Assurance**: Test the deliverables to ensure quality, reliability, and adherence to requirements.
✓ **Deployment**: Deliver functional increments to the customer after each iteration.
✓ **Feedback**: Gather feedback from stakeholders to refine requirements and improve the product in the next iteration.

Principles of the Agile Model

✓ Customer satisfaction through **early and continuous delivery**.
✓ Embrace **changing requirements** even late in development.
✓ Deliver **working software frequently** (weeks, not months).
✓ Foster close collaboration between **developers and stakeholders**.
✓ Build projects around **motivated individuals**.
✓ Use **face-to-face communication** as the most effective method.
✓ Working software is the **primary measure of progress**.

✓ Promote **sustainable development** (constant pace).
✓ Continuous attention to **technical excellence** and design.
✓ Keep it **simple** and minimize unnecessary work.
✓ Encourage **self-organizing teams**.
✓ Regularly reflect and **adjust processes** for improvement.

Characteristics of the Agile Process

✓ **Iterative and Incremental**: Development occurs in cycles, delivering functional parts of the product incrementally.
✓ **Collaborative**: Emphasis on teamwork, communication, and customer involvement.
✓ **Adaptive to Change**: Flexibility to handle evolving requirements.
✓ **Time-Boxed**: Sprints or iterations have fixed time durations.
✓ **Continuous Feedback**: Regular feedback loops ensure alignment with customer goals.
✓ **Test-Driven Development (TDD)**: Testing is integral, ensuring quality throughout the process.

When to Use the Agile Model?

✓ Requirements are **evolving or unclear**.
✓ Projects need to deliver value **incrementally**.
✓ Teams require **close collaboration** with stakeholders.
✓ The product requires **frequent updates** or changes.
✓ Projects are **complex and require flexibility**.

Examples: Software product development, mobile app development, and projects with short timelines.

Advantages of the Agile Model

✓ **Faster Delivery**: Quick iterations ensure rapid delivery of functional software.
✓ **Flexibility**: Easily adapts to changing requirements.
✓ **Improved Collaboration**: Close communication between developers, stakeholders, and customers.
✓ **High-Quality Outputs**: Continuous testing ensures bugs are minimized.
✓ **Customer Satisfaction**: Regular feedback helps align the product with user needs.
✓ **Transparency**: Clients can monitor progress at every stage.

Disadvantages of the Agile Model

- ✓ **Lack of Documentation**: Heavy reliance on communication can lead to insufficient documentation.
- ✓ **Requires Skilled Teams**: Agile works best with experienced and self-motivated team members.
- ✓ **Scope Creep**: Continuous changes may expand project scope beyond expectations.
- ✓ **Time-Intensive**: Frequent meetings (e.g., stand-ups) can disrupt productivity.
- ✓ **Not Suitable for All Projects**: Works poorly for small teams or projects with fixed, clear requirements.

Conclusion

The Agile Model revolutionized software development by focusing on adaptability, customer involvement, and delivering incremental value. It is particularly effective for projects with evolving requirements and where collaboration is essential. Agile promotes continuous improvement, ensuring the final product aligns closely with user needs. While it offers flexibility and faster delivery, it requires disciplined teams to handle challenges like scope creep and limited documentation.

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