HSC Software Engineering

Year 11 - Programming Fundamentals - Software Development Approaches

Objectives

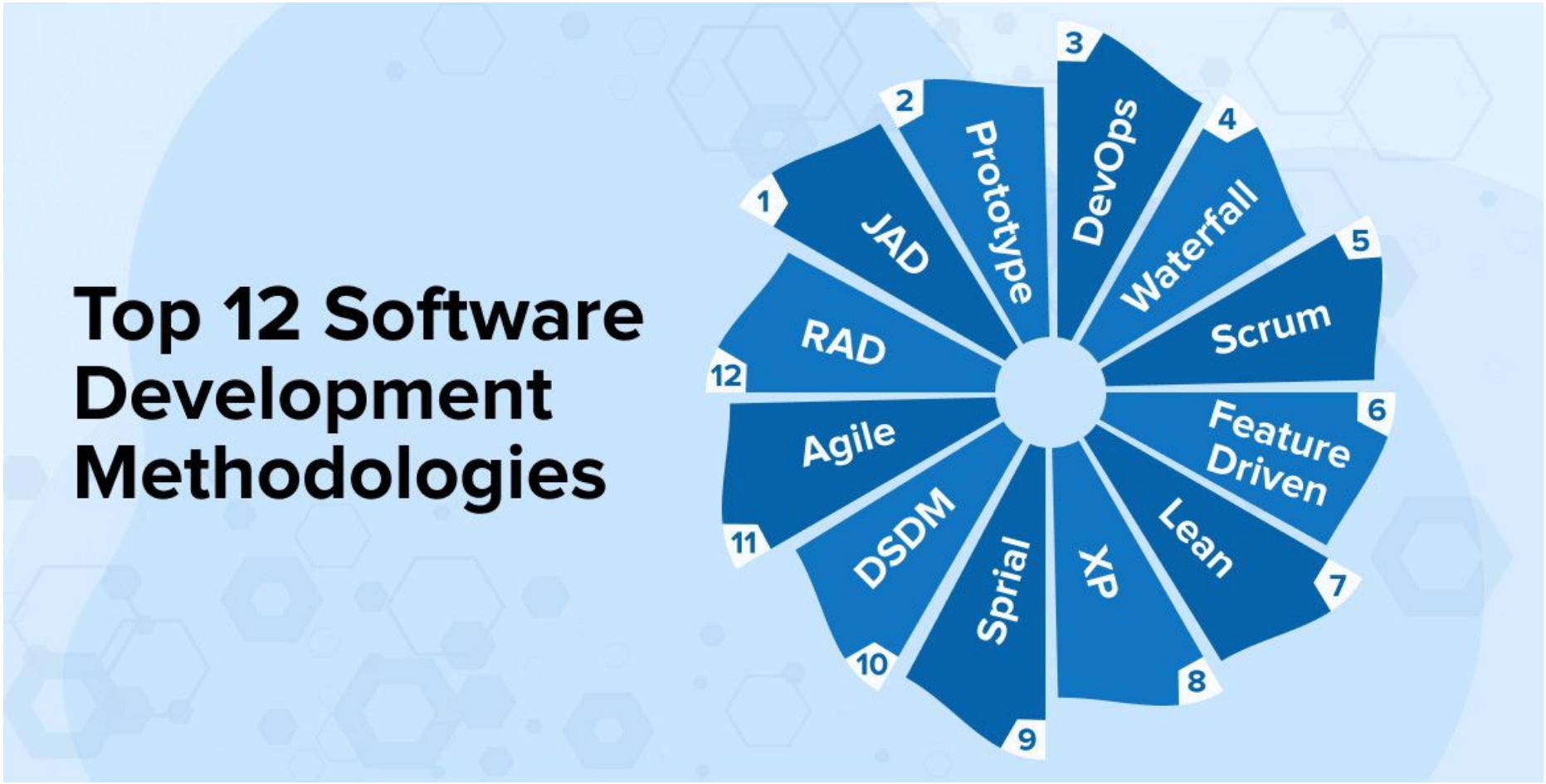
- Compare the execution of the Waterfall, Agile and Wagile project management models as applied to software development

Glossary

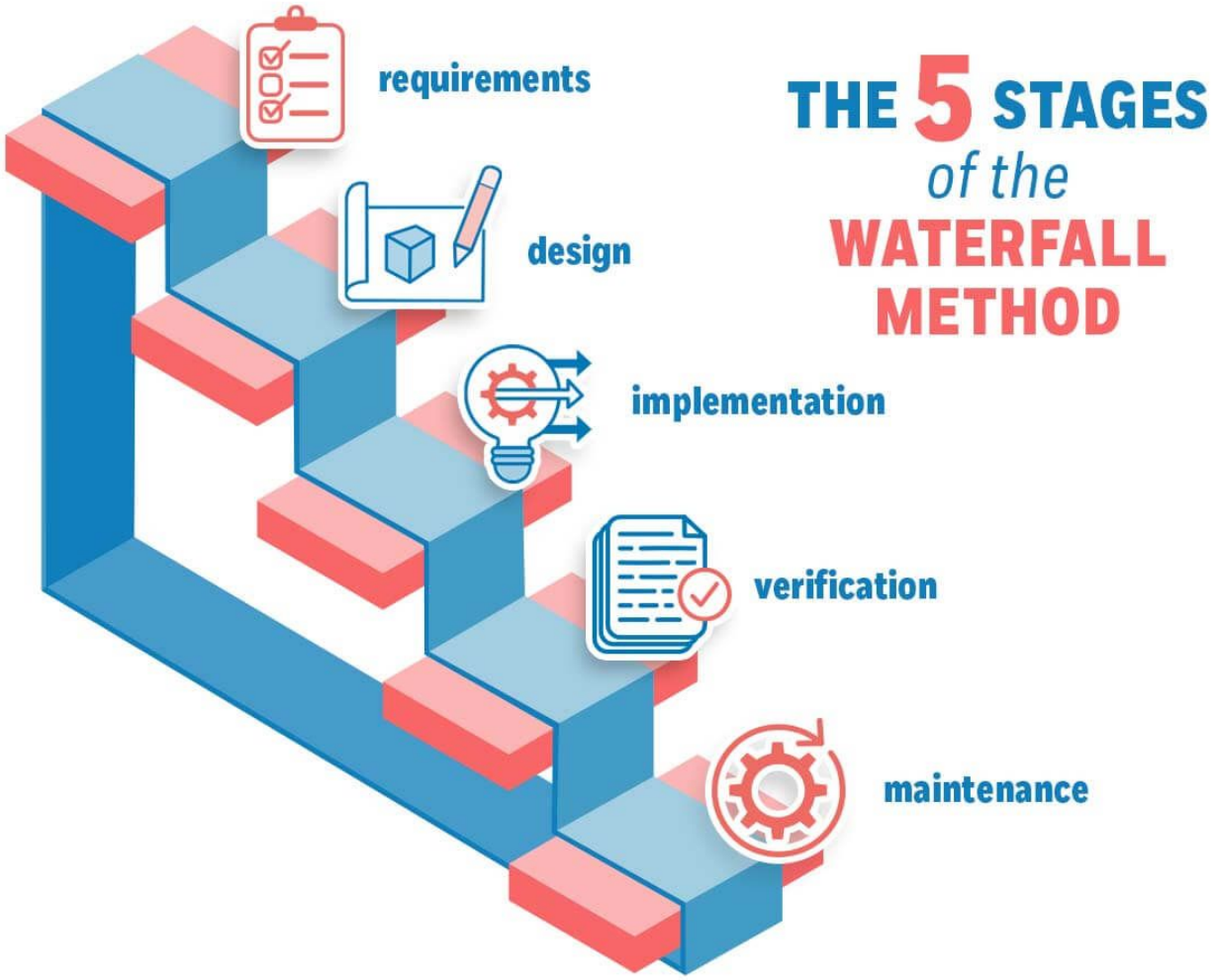
Waterfall
Agile
Wagile

Software Development Approaches

Software Development Approaches



Waterfall


requirements
design
implementation
verification
maintenance
THE 5 STAGES
of the
WATERFALL
METHOD

Waterfall

1. **Sequential Phases:** Each phase must be completed before the next one begins.
2. **Documentation:** Emphasis is placed on documentation at each stage.
3. **Planning and Design**: Extensive planning and complete design are done at the beginning.
4. **Testing:** Testing is a separate phase and occurs after the build phase.
5. **Changes and Revisions:** Difficult and costly, as it usually requires revisiting and revising earlier stages.
6. **Project Completion:** The product is delivered in its entirety after the final phase.

Agile


SPRINT 1
PLAN
DESIGN
LAUNCH
REVIEW
DEPLOY
TEST
DEVELOP
SPRINT 2
PLAN
DESIGN
LAUNCH
REVIEW
DEPLOY
TEST
DEVELOP
SPRINT 3
PLAN
DESIGN
LAUNCH
REVIEW
DEPLOY
TEST
DEVELOP

Agile

1. **Iterative and Incremental:** Iterative approach where the project is divided into small increments known as 'sprints'.
2. **Continuous Collaboration:** Continuous collaboration with the customer and cross-functional teams.
3. **Adaptive Planning:** Rapid and flexible response to change.
4. **Testing:** Testing is continuous and occurs simultaneously with development.
5. **Customer Feedback:** Regular feedback from the end-user is encouraged.
6. **Product Releases:** The most important features are developed first resulting in multiple releases.

Advantages Of Waterfall & Agile

Waterfall

- Clear Deadlines & Project Objectives
- End Results Are Well-Defined & Predictable
- Defined Tasks & Roles
- Detailed Project Plan & Due Dates.
- User Involvement Is Minimal

Agile

- Participation & Cooperation with Stakeholders
- More Rapid Time To Market
- Increased Value For Clients
- Flexible Updates That Come Frequently
- Space For Creative Problem-solving

Wagile

- Combination of the two
- Can start Agile for Requirements and design before going to Waterfall for Implementation and Testing
- Could start Waterfall and move to Agile.
- Choice depends on the type of project, skills of team, focus on skills, knowledge etc.

Waterfall Project Scenarios

- Waterfall is best suited for projects with well-defined requirements, a clear scope, and minimal expected changes.
- **Scenario 1: Government Compliance System**
  - A government agency needs a system for tax filing that must comply with strict legal regulations.
  - Requirements are fully defined upfront, and changes would require formal approval.
  - Security and compliance audits must be conducted before deployment.
- **Scenario 2: Construction Project Management Software**
  - A construction company requires software for tracking materials and worker schedules.
  - The design must be completed before implementation since construction processes are rigid.
  - Changes after development would be costly and time-consuming.
- **Scenario 3: Embedded Systems for a Medical Device**
  - A company is developing firmware for a pacemaker, which must meet medical industry standards.
  - Regulatory approval requires detailed documentation and rigorous testing.

Agile Project Scenarios

Agile works well for projects with evolving requirements, iterative development, and continuous feedback.

Scenario 1: E-Commerce Website for a Startup

- A startup is launching an online store but is unsure about customer preferences.
- Features such as payment gateways, recommendation systems, and chat support can be adjusted based on feedback.
- Continuous iteration allows quick adaptation to changing market trends.

Scenario 2: AI-Powered Chatbot for Customer Support

- A company wants to integrate a chatbot but isn't sure about user queries and behaviors.
- Agile allows them to start with a basic chatbot and improve it based on user interactions.
- Machine learning models can be iteratively trained with real-time data.

Scenario 3: Mobile Game Development

- A game studio is developing a new mobile game and wants to test different mechanics.
- Agile sprints help developers release prototypes, gather user feedback, and iterate gameplay elements.

Wagile Project Scenarios

Wagile is suited for projects that require upfront planning but also need flexibility for incremental improvements.

Scenario 1: Banking Application Modernization

- A bank wants to update its legacy banking system while ensuring regulatory compliance.
- Waterfall is used for core banking functions that must remain stable.
- Agile is used for customer-facing features like a mobile app and personalized recommendations.

Scenario 3: Smart City IoT Deployment

- A city is deploying a smart infrastructure with traffic sensors and energy management.
- Waterfall is used for foundational components like network setup and security protocols.
- Agile teams work on real-time data dashboards, predictive analytics, and citizen applications.