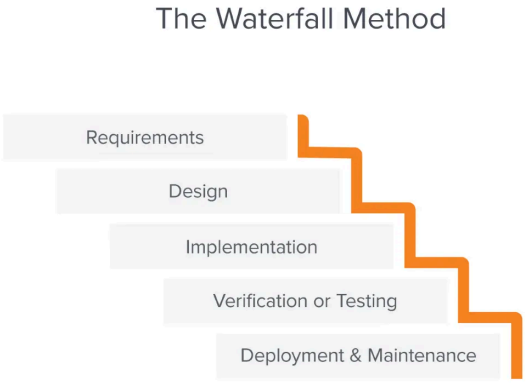
NINO FIDEL R. VELASCO II
BSIT 3-1

Software Development Methodologies



WATER FALL METHOD - is a traditional, linear, and sequential project management approach. It involves distinct phases, requirements **gathering, design, implementation, testing, deployment, and maintenance** that must be completed in order. Like a waterfall cascading down a cliff, one stage flows into the next only after the previous one has been fully completed.

Key Characteristics

Waterfall relies heavily on detailed planning at the start. The assumption is that all project requirements can be gathered and fully understood before development begins. Once the project scope, cost, timeline, risks, and success metrics are documented, the project team works according to this predefined plan.

The **requirements document** becomes the central point of reference, outlining every detail necessary for implementation. This includes stakeholder expectations, technical specifications, and all anticipated deliverables.

Advantages

1. **Structured Planning**: Because of its rigid structure, project managers can estimate the total cost and timeline with considerable accuracy.

2. **Early Error Detection**: Since design and analysis occur before implementation, design flaws can be identified early, preventing costly rework during development.

3. **Clear Milestones**: The progression from one phase to the next is straightforward, making it easier to track progress and maintain accountability.

4. **Smooth Onboarding**: New team members can quickly get up to speed by reviewing comprehensive documentation.

5. **Stable Scope**: Clients are less likely to make mid-project changes, which helps keep the project on track.

Disadvantages

Despite its strengths, the Waterfall method has notable limitations, especially in dynamic or evolving projects:

1. **Limited Flexibility**: Once the project is underway, making changes to scope or requirements is difficult and often costly.

2. **Longer Timelines**: Because testing and deployment occur only after implementation is complete, projects can take longer to deliver.

3. **Client Detachment**: Clients are not usually involved during design and development, potentially leading to misalignment between expectations and the final product.

4. **Deadline Creep**: A delay in one phase results in cascading delays across subsequent stages.

5. **Assumes Complete Understanding**: It assumes that all requirements can be defined upfront, which may not be realistic for complex or innovative projects.

Common Use Cases

Waterfall is most effective when:

- Project requirements are well-defined and unlikely to change.

- The client has a clear vision of the final product.

- The team benefits from a predictable structure.

- Deliverables are straightforward (e.g., construction, infrastructure projects, or simple software applications).

If the project manager prefers detailed processes and a defined budget and timeline, and the project is conducive to those constraints, the Waterfall method is often the go-to strategy.

AGILE METHOD - iterative, adaptive, and collaborative. Agile breaks down projects into smaller cycles called **sprints**, usually lasting two to four weeks. At the end of each sprint, teams deliver a functional product increment that can be reviewed and refined based on stakeholder feedback.

Key Characteristics

Agile emphasizes **flexibility, teamwork, and customer collaboration**. The core principle is to embrace change even late in development—if it helps deliver more value to the end user. Agile frameworks like Scrum, Kanban, and Extreme Programming (XP) are often used to implement Agile principles in practical settings.

Daily standups, sprint reviews, retrospectives, and backlogs are integral parts of Agile processes. These rituals encourage open communication and rapid problem-solving.

Advantages

1. **Faster Results**: Working in small iterations allows teams to make rapid progress and demonstrate value regularly.

2. **Customer Alignment**: Continuous involvement from customers and stakeholders ensures that the project stays aligned with expectations.

3. **Greater Flexibility**: Agile accommodates evolving requirements and changes mid-project without derailing the overall goal.

4. **Encourages Innovation**: Teams can experiment with solutions and make improvements based on feedback after each sprint.

5. **Team Empowerment**: Agile fosters a collaborative environment where every team member contributes to planning and execution.

Disadvantages

Agile, however, is not without its challenges:

1. **Uncertain Timelines**: Because of its flexible nature, it can be difficult to estimate final delivery dates and costs.

2. **Scope Creep**: Frequent changes and new feature requests can lead to scope creep, threatening deadlines and budgets.

3. **Stakeholder Fatigue**: Constant feedback loops and reviews can be exhausting for stakeholders with limited availability.

4. **Decision Fatigue**: Teams may experience mental burnout due to continuous decision-making and iteration.

5. **Difficult Scaling**: In large organizations or regulated industries, scaling Agile requires significant cultural and operational shifts.

Common Use Cases

Agile is ideal for:

- Projects with evolving or unclear requirements.

- Software development where frequent updates or releases are needed.

- Startups and innovative projects that need quick validation from users.
- Cross-functional teams looking to improve collaboration and feedback cycles.

Agile works best when rapid delivery, collaboration, and flexibility are more important than rigid structure and predictability.

LEAN METHOD - customer-centric, efficiency-driven project management approach that aims to eliminate waste and maximize value. Originating from **Lean manufacturing**, particularly Toyota's production system, Lean is now widely applied across industries, including software, healthcare, and service industries.

Key Characteristics

Lean focuses on creating more value with fewer resources by optimizing workflows, improving processes, and involving the entire team. It emphasizes **continuous improvement**, or "Kaizen," and respect for people—both customers and workers.

It uses techniques like **value stream mapping** to identify and eliminate non-value-adding activities. Teams are encouraged to test ideas quickly, receive feedback, and adapt accordingly.

Advantages

1. **Efficiency Boost**: By removing bottlenecks and redundant processes, Lean improves team productivity and speeds up delivery.

2. **Reduced Costs**: Lean minimizes overproduction and resource waste, which can significantly lower operational expenses.

3. **Improved Communication**: With clear roles, responsibilities, and transparency, teams work more cohesively and collaboratively.

4. **Customer-Centric Focus**: Projects are built around what the customer truly values, which strengthens satisfaction and loyalty.

5. **Empowered Teams**: Team members are involved in decision-making, increasing engagement and accountability.

6. **Ongoing Improvements**: With its iterative mindset, Lean fosters a culture of continuous learning and development.

Disadvantages

Despite its strengths, Lean comes with its own set of hurdles:

1. **Poor Management Support**: Without committed leadership, Lean initiatives often stall or fail altogether.

2. **Lack of Training**: Teams unfamiliar with Lean principles can struggle with implementation, resulting in inefficiencies.

3. **Misplaced Tool Focus**: Prioritizing tools over people may lead to disengagement or resistance.

4. **Insufficient Metrics**: Without proper tracking and metrics, it's hard to measure progress or validate process changes.

Common Use Cases

Lean works well in:

- Manufacturing industries seeking to streamline production lines.
- Software development projects with long-term goals of process improvement.
- Customer-facing teams aiming to optimize service delivery and reduce response time.
- Startups or businesses looking to do more with fewer resources.

Lean is best suited for organizations that prioritize long-term efficiency, cost savings, and customer satisfaction.

Evaluation

Based on my understanding, our system is designed to manage the **professors' application process** at **PUP San Pedro Campus**. The **Waterfall methodology** appears to be a suitable choice for this type of system, as the current application process is already well-established and follows a clear, sequential flow. The primary objective is to **digitize and transform** the existing manual process into a **web-based system**, which aligns with the structured and linear nature of the Waterfall model.

However, the **Agile methodology** could also be considered, especially if we anticipate ongoing changes or the addition of new features during development. Agile would allow for greater flexibility and faster adaptation to feedback or evolving user needs. On the other hand, if we foresee continuous updates, user feedback, and evolving functionality, adopting Agile or a **hybrid approach** combining both methodologies may be more beneficial. It is suggested to assess the development timeline, stakeholder involvement, and potential for change to determine the most appropriate methodology for successful project delivery.

- What are the unique characteristics of your capstone project that require a specific methodology?

The current application process is already well-established and follows a clear, sequential flow, which is why the Waterfall methodology could be the most suitable approach for this type of system.

- How does the selected methodology support project goals (e.g., flexibility, speed, quality)?

In terms of flexibility, using a hybrid methodology makes the development process more progressive. Waterfall provides a concrete and structured path, while Agile introduces flexibility by allowing the addition of unexpected features or changes during development.

- Why is this methodology the best fit in terms of collaboration, communication, and risk management?

For this kind of system, it is better to have close consultation with the client in order to ensure the system aligns closely with their needs.

References

(*Waterfall Methodology: Project Management | Adobe Workfront*, 2022)
Waterfall Methodology: Project Management | Adobe Workfront.

Gurnov, A. (2025, April 4). What is Agile methodology in Project Management? | Wrike 2025.

Wrike.

What is Agile methodology in Project Management? | Wrike 2025

Mohan, M. C. (2023, February 2)
Top Agile Methodologies and their use cases | by Mithun Chandra Mohan | Medium.

Atlassian, B. (n.d.). What is Lean Methodology? | Atlassian. Atlassian.

What is Lean Methodology? | Atlassian