Assignment 3: Research and compare SDLC models suitable for engineering projects. Present findings on Waterfall, Agile, Spiral, and V-Model approaches, emphasizing their advantages, disadvantages, and applicability in different engineering contexts.

Let's compare four commonly used SDLC models: Waterfall, Agile, Spiral, and V-Model,highlighting their advantages, disadvantages, and applicability in various engineering context.

Waterfall model:

Waterfall approach was first SDLC Model to be used widely in Software Engineering to ensure success of the project. In "The Waterfall" approach, the whole process of software development is divided into separate phases. In Waterfall model, typically, the outcome of one phase acts as the input for the next phase sequentially.

Advantages:

Simple and easy to understand and use.
 Easy to manage due to the rigidity of the model – each phase has specific deliverables and a review process.
 Phases are processed and completed one at a time.
 Works well for smaller projects where requirements are very well understood.
 Process and results are well documented

Disadvantages:

No working software is produced until late during the life cycle.
 High amounts of risk and uncertainty.
 Not a good model for complex and object-oriented projects.
 Poor model for long and ongoing projects.
 Not suitable for the projects where requirements are at a moderate to high risk of changing. So risk and uncertainty is high with this process model.

Applicability: Waterfall is suitable for projects with well-understood and stable requirements, such as building infrastructure, where changes are unlikely.

Agile Model:

In agile the tasks are divided to time boxes (small time frames) to deliver specific features for a release. Iterative approach is taken and working software build is delivered after each iteration. Each build is incremental in terms of features; the final build holds all the features required by the customer.

Adavantages:

Is a very realistic approach to software development
 Promotes teamwork and cross training.
 Functionality can be developed rapidly and demonstrated.
 Resource requirements are minimum.
 Suitable for fixed or changing requirements
 Delivers early partial working solutions.
 Good model for environments that change steadily.
 Minimal rules, documentation easily employed.

Disadvantages:

Not suitable for handling complex dependencies.
 More risk of sustainability, maintainability and extensibility.
 An overall plan, an agile leader and agile PM practice is a must without which it will not work.
 Strict delivery management dictates the scope, functionality to be delivered, and adjustments to meet the deadlines.
 Depends heavily on customer interaction, so if customer is not clear, team can be driven in the wrong direction.

Applicability:

Agile is ideal for projects with evolving or uncertain requirements, such as software development, where rapid adaptation to changes is essential.

Spiral model:

spiral model is a combination of iterative development process model and sequential linear development model i.e. waterfall model with very high emphasis on risk analysis. It allows for incremental releases of the product, or incremental refinement through each iteration around the spiral.

Advantages:

 Changing requirements can be accommodated.
 Allows for extensive use of prototypes
 Requirements can be captured more accurately.
 Development can be divided into smaller parts and more risky parts can be developed earlier which helps better risk management

Disadvantages:

 End of project may not be known early.
 Not suitable for small or low risk projects and could be expensive for small projects.
 Large number of intermediate stages requires excessive documentation .

Appicablity: Spiral is suitable for large-scale projects with high complexity and significant risks, such
as software projects involving new technologies or critical systems development.

V Model:

V-Model is an extension of the waterfall model and is based on association of a testing phase for each corresponding development stage. This means that for every single phase in the development cycle there is a directly associated testing phase. This is a highly disciplined model and next phase starts only after completion of the previous phase.

Advantages:

- This is a highly disciplined model and Phases are completed one at a time.
- Works well for smaller projects where requirements are very well understood.
- Simple and easy to understand and use.

Disadvantages:

 Not a good model for complex and object-oriented projects.
 Poor model for long and ongoing projects.
 Not suitable for the projects where requirements are at a moderate to high risk of changing.

Appicability:

V-Model is suitable for projects with well-defined requirements and a focus on quality assurance, such as safety-critical systems or projects with stringent regulatory requirements.

Conclusion:

Each SDLC model has its own advantages, disadvantages, and suitability for different engineering contexts. Waterfall is best suited for projects with stable requirements, while Agile is ideal for projects with evolving requirements. Spiral is well-suited for complex projects with high uncertainty and risks, while V-Model is suitable for projects with a strong focus on quality assurance and regulatory compliance. The choice of SDLC model depends on factors such as project size, complexity, requirements stability, and industry regulations.