Differences between waterfall,agile,v-model and spiral

**Waterfall Model**:

**Waterfall Model** is a sequential model that divides software development into pre-defined phases. Each phase must be completed before the next phase can begin with no overlap between the phases. Each phase is designed for performing specific activity during the SDLC phase

**Advantage:**

* This model is simple and easy to understand and use.
* It is easy to manage due to the rigidity of the model – each phase has specific deliverables and a review process.
* In this model phases are processed and completed one at a time. Phases do not overlap.
* Waterfall model works well for smaller projects where requirements are clearly defined and very well understood.

**Disadvantage:**

* Once an application is in the [**testing**](https://tryqa.com/what-is-a-software-testing/) stage, it is very difficult to go back and change something that was not well-thought out in the concept stage.
* 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.

**Agile Model**

**Agile development model** is also a type of Incremental model. Software is developed in incremental, rapid cycles. This results in small incremental releases with each release building on previous functionality. Each release is thorough tested to ensure software quality is maintained. It is used for time critical applications.  Extreme Programming (XP) is currently one of the most well known agile development life cycle model.

**Advantanges:**

* Customer satisfaction by rapid, continuous delivery of useful software.
* People and interactions are emphasized rather than process and tools. Customers, developers and testers constantly interact with each other.
* Working software is delivered frequently (weeks rather than months).
* Face-to-face conversation is the best form of communication.
* Close, daily cooperation between business people and developers.
* Continuous attention to technical excellence and good design.
* Regular adaptation to changing circumstances.
* Even late changes in requirements are welcomed

**Disadvantages:**

* In case of some software deliverables, especially the large ones, it is difficult to assess the effort required at the beginning of the software development life cycle.
* There is lack of emphasis on necessary designing and documentation.
* The project can easily get taken off track if the customer representative is not clear what final outcome that they want.
* Only senior programmers are capable of taking the kind of decisions required during the development process. Hence it has no place for newbie programmers, unless combined with experienced resources.

**V-Model :**

V- model means Verification and Validation model. Just like the waterfall model, the V-Shaped life cycle is a sequential path of execution of processes. Each phase must be completed before the next phase begins.

**Advantage:**

* Simple and easy to use.
* Testing activities like planning, test designing happens well before coding. This saves a lot of time. Hence higher chance of success over the waterfall model.
* Proactive defect tracking – that is defects are found at early stage.
* Avoids the downward flow of the defects.
* Works well for small projects where requirements are easily understood.

**Disadvantages of V-model:**

* Very rigid and least flexible.
* Software is developed during the implementation phase, so no early prototypes of the software are produced.
* If any changes happen in midway, then the test documents along with requirement documents has to be updated.

**Spiral model:**

The spiral model is similar to the incremental model, with more emphasis placed on risk analysis. The spiral model has four phases: Planning, Risk Analysis, Engineering and Evaluation. A software project repeatedly passes through these phases in iterations (called Spirals in this model). The baseline spiral, starting in the planning phase, requirements are gathered and risk is assessed. Each subsequent spirals builds on the baseline spiral.

**Advantages of Spiral model:**

* High amount of risk analysis hence, avoidance of Risk is enhanced.
* Good for large and mission-critical projects.
* Strong approval and documentation control.
* Additional Functionality can be added at a later date.
* Software is produced early in the software life cycle.

**Disadvantages of Spiral model:**

* Can be a costly model to use.
* Risk analysis requires highly specific expertise.
* Project’s success is highly dependent on the risk analysis phase.
* Doesn’t work well for smaller projects.