



A Survey of Software Development Process Models in Software Engineering

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ABSTRACT

Software has been a significant part of modern society for a long time. In particular, this paper is concerned with various software development process models. Software process model is a description of the sequence of activities carried out in a software engineering project, and the relative order of these activities. It represents some of the development models namely, waterfall, v-shaped, incremental, RAD, iterative spiral and agile model.

Keywords:

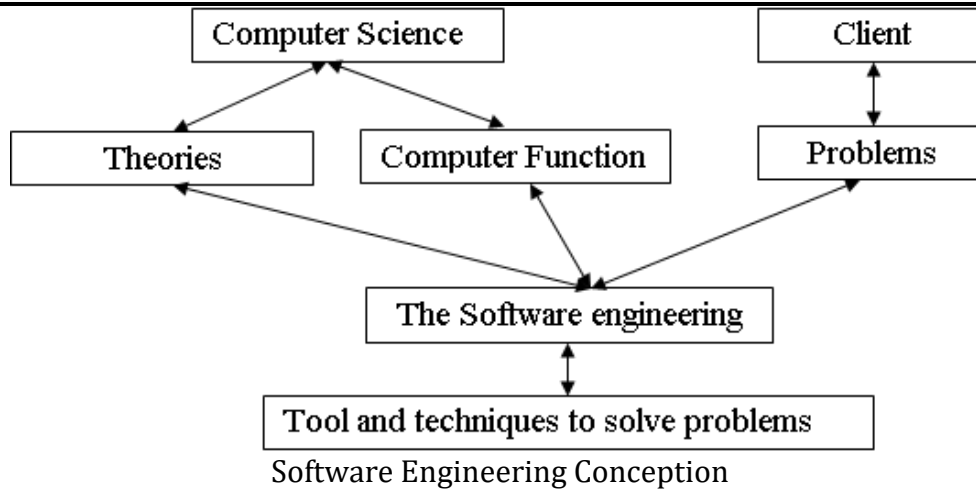
Software development, Process models, SDLC, Software engineering.

Introduction. Software Engineering is concerned with designing, writing, testing, implementing and maintaining software. It forms the basis of operational design and development to all computer systems. Functionality of computers is because of software. A software development process, also known as a software development life cycle (SDLC), is a structure imposed on the development of a software product. It is often considered as a subset of system development life cycle. There are several models for such processes, each describing approaches to a variety of activities that take place during the process. The development models are the various processes or methodologies that are

being selected for the development of the project depending on the project's aims and goals.

There are various Software development models or methodologies. They are as follows: Waterfall model; V model; Incremental model; RAD model; Iterative model.

Process Models. In this section, we briefly discuss all the software development process models including the advantages and disadvantages of each model. Moreover, we also mention the different suitable cases of using these models



1.

2. **Waterfall Model.** The waterfall model is a sequential design process, often used in software development processes, in which progress is seen as flowing steadily downwards (like a waterfall) through the phases of conception, initiation, analysis, design, implementation, testing and maintenance. In this model, each phase must be completed fully before the next phase can begin. At the end of each phase, a review takes place to determine if the project is on the right path and whether or not to continue or discard the project. Moreover, in this model phases do not overlap.

We have to use waterfall model in the following cases, such as- 1) When requirements are very well known, clear and fixed, 2) Product definition is stable, 3) Technology is understood, 4) There are no ambiguous requirements, sufficient resources with required expertise are available and 5) The project is short.

Advantages of Waterfall Model:

- Simple and easy to understand and use.
- Easy to manage due to the rigidity of the model, because each phase has specific deliverables and a review process and completed one at a time.
- Works well for smaller projects where requirements are very well understood and sufficient.

Disadvantages of Waterfall Model:

- Once an application is in the 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.
- It is not good for long, complex and object-oriented projects.
- Not suitable for the projects where requirements are at a moderate to high risk of changing.

3. **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. Testing of the product is planned in parallel with a corresponding phase of development.

Advantages of V-model:

- 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.

4. Incremental Model .In incremental model the whole requirement is divided into various builds. Multiple development cycles take place here, making the life cycle a “multi-waterfall” cycle. Cycles are divided up into smaller, more easily managed modules. Each module passes through the requirements, design, implementation and testing phase. A working version of software is produced during the first module, so you have working software early on during the software life cycle. Each subsequent release of the module adds function to the previous release. The process continues till the complete system is achieved.

Advantages of Incremental Model:

➤ Generates working software quickly and early during the software life cycle.

➤ More flexible – less costly to change scope and requirements.

➤ Easier to test and debug during a smaller iteration.

➤ Customer can respond to each built.

➤ Lowers initial delivery cost.

➤ Easier to manage risk because risky pieces are identified and handled during its iteration.

Disadvantages of Incremental Model:

➤ Needs good planning and design.

➤ Needs a clear and complete definition of the whole system before it can be broken down and built incrementally.

➤ Total cost is higher than waterfall.

5. RAD Model . RAD model is Rapid Application Development model. It is a type of incremental model. In RAD model the components or functions are developed in parallel as if they were mini projects. The developments are time boxed, delivered and then assembled into a working prototype. This can quickly give the customer something to see and use and to provide feedback regarding the delivery and their requirements.

Advantages of the RAD Model:

➤ Reduced development time.

➤ Increases reusability of components

➤ Quick initial reviews occur

➤ Encourages customer feedback

➤ Integration from very beginning solves a lot of integration issues.

Disadvantages of RAD Model:

➤ Depends on strong team and individual performances for identifying business requirements.

➤ Only system that can be modularized can be built using RAD

➤ Requires highly skilled developers/designers.

➤ High dependency on modeling skills

➤ Inapplicable to cheaper projects as cost of modeling and automated code generation is very high.

6. Iterative Model. An iterative life cycle model does not attempt to start with a full specification of requirements. Instead, development begins by specifying and implementing just part of the software, which can then be reviewed in order to identify further requirements. This process is then repeated, producing a new version of the software for each cycle of the model.

We use Iterative model in these situations.

1) Requirements of the complete system are clearly defined and understood,

2) When the project is big. 3) Major requirements must be defined; however, some details can evolve with time.

Advantages of Iterative Model:

➤ In iterative model we can only create a high-level design of the application before we actually begin to build the product and define the design solution for the entire product. Later on we can design and built a skeleton version of that, and then evolved the design based on what had been built.

➤ In iterative model we are building and improving the product step by step. Hence we can track the defects at early stages. This avoids the downward flow of the defects.

➤ In iterative model we can get the reliable user feedback. When presenting sketches and blueprints of the product to users for their feedback, we are effectively asking them to imagine how the product will work.

➤ In iterative model less time is spent on documenting and more time is given for designing.

Disadvantages of Iterative Model:

➤ Each phase of an iteration is rigid with no overlaps

➤ Costly system architecture or design issues may arise because not all requirements are gathered up front for the entire lifecycle

Conclusion. A study is given about different development models and their comparison. This paper explained seven different models out of those. First one is Waterfall model which provides base for other development models. Then its enhanced models are explained in Iterative model, Spiral model, V shaped model and finally, Agile development model. The comparison includes the advantages and disadvantages of different models which can help to select specific model at specific situation depending on customer demand.

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