An Empirical Research On The Software Engineering Process Models

Mr. G. SHIVA KRISHNA
Asst.Professor, Dept.of CSE
TeegalaKrishnaReddy Engineering College
Hyderabad.

Mr. G. VAMSHI KRISHNA
Asst.Professor, Dept.of CSE
TeegalaKrishnaReddy Engineering College
Hyderabad.

Abstract: **Technology is increasing day by day and as per the needs of consumers so many applications are developing regularly. To achieve the success of all these applications one should follow the software process in implementing the system. Without following the software engineering process also we can develop the application but we can't assure the client that the end product will attain the quality and the satisfaction of the customers. To implement the applications in a systematic way, there are different software process models are there. Let us review some of the models along with their advantages and dis-advantages. By going through with this review one can easily estimate which model will be best suitable for their development environment.**

Keywords— **Software Engineering; Process Models;**

I. INTRODUCTION

Importance of using software engineering process models are increasing day by day. These models are showing a way to develop an application in the step wise manner. Whenever if any user is implementing an application then definitely there exists the difference in the products which followed the software engineering practices. Even the applications can be built without following any models but they will be lacking the quality. To overcome all these concepts we are presenting the review of different models. All these models are clearly explained with their advantages and dis-advantages.

II. PROCESS MODELS

Prototype model:

This model will suit to different applications where there is the need of continuous interaction between client and developer. The following are the features of this model.

a. Client interaction is allowed in between the development of the application.

b. After the evaluation of the client, then only the other requirement implementation starts.

c. This model mainly focuses on client satisfaction.

d. This process is a iterative process where for every requirement the same process will be carried out. The following figure represents the Prototype model.
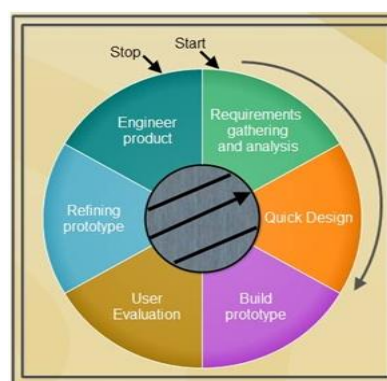

Figure 1: Prototype Model

Advantages:

a. All the requirements, missing functionalities are identified in the early stage and are refined properly before going to implement them.

B. Strong interaction is allowed in between the users and developers which makes the requirements very clear and complete.

c. It is a iterative process where the prototype of implementable system is shown to the end user and take the permission to move forward in implementing the system. This makes the identification of wrong, missing and confusing functionalities.

d. Changes suggested by the user are implemented in every iteration. It is a iterative process.

WaterFall Model:

The Waterfall Process Model is also called as linear sequential model [2] was the first process model to present sequential framework, describing basic stages for successful software development model. It states that the phases are organized in a linear order.
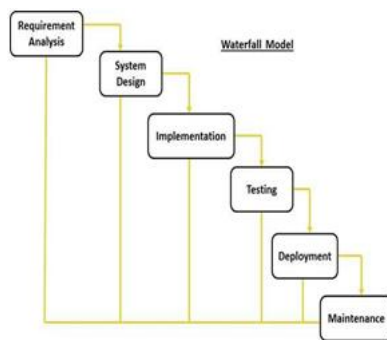
Figure 2: Waterfall model

The following are the phases of Waterfall model. They are

Requirement Analysis: In this phase software requirements are gathered and analysis made on the information. Based on this phase requirements are constructed.

System Design: Requirements are gets transformed int representation. By seeing the design one can easily understand the flow of information in the application.

Coding: In this phase the representations are converted into the implementation. All the given requirements are coded in the selected language and they will be submitted to the next phase.

Testing: This is another phase where cross verification of the requirements are had. If anything goes wrong then they are corrected in this phase.

Maintenance: This is the last phase where it will done at the client end. In this phase mainly changes are done. If the client needs to have changes then they will be implemented in this phase.

Advantages of Waterfall model:

+ Use of this model is to all the developers.

+ Easy to understood milestones.

+ It is developer's model, because there won't be any interaction of client is entertained in the middle of the development.

Limitations of Waterfall model:

- It assumes that the requirements can be frozen(baseline) before the design begins.(not practical)

- Freezing the requirements requires choosing the hardware, which on completion of the project may become obsolete.

- It requires that the requirement be completely specified before the rest of the development can proceed, but in some systems it can be desirable to develop a part of it, and later enhance the system.

- Document driven process, not suitable for interactive applications.
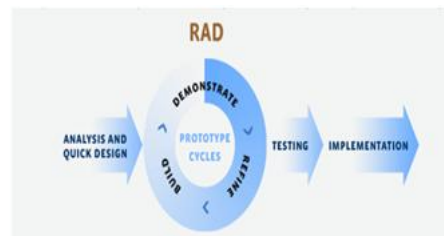
RAD Model:

RAD means Rapid application development model which is an incremental model.

 In this model no proper planning is involved in gathering and implementing the requirements.

All activities are made individually and parallel and after the completion of implementing they will be integrating in achieving the goals of the system. This model focuses on parallel activities.

All the individual activities are implemented as prototypes. RAD model follows the iterative and incremental methodology in order to build the system.

By using this model one has to build the reusable modules so that we can achieve the importance of the model.

JAD MODEL:

Different people are involved in obtaining the system business requirements by using JAD(Joint Application Development) approach. This forum of people is known as JAD Session. The following steps are conducted to complete the JAD approach.

a. **Defining the Session:** Every JAD session will have the purpose, scope and what to achieve by this session. To complete this session we have to identify the stake holders who are involved in the business process as well as Technical team of the JAD. After identifying the people we have to plan the schedule of the session.

b. **Giving prior notice to Stake holders:** After identifying the stake holders, It is the responsibility of JAD team to give the information on the session so that they can come with the preparation on the business process of the system or else there may be chance of giving wrong or ambiguous statements which leads the malfunctioning of the system.

c. **Organize the session:** Meeting room should be prepared in conducting the session with some visual aids, proper agenda, writing the minutes of meeting etc.

d. Implementing the session: As per the agenda the session should be followed and care should be taken that everyone should get a chance to explore their needs. This session should be recorded so that the requirements are framed in appropriate way.

e. Documenting the session: After completing the session, further analysis has to be done by the JAD team and then all these things are documented to have the final requirements. This final document should be certified by the stake holder to avoid any kind of discrepancies in the system.

SPIRAL MODEL: The main phases of spiral model is to determine objectives, identify and resolve risks, develop and test, plan the next iteration. This model mainly focuses on the risk management.

A cycle begins with identifying the objective, different alternatives and the associated constraints. The process from the center of the spiral proceeding in the clockwise direction. There are various tasks regions in this model. The radial dimension represents the cost incurred; the angular dimension represents the progress in each activity of the cycle. Each cycle is completed by the review of the activities of that cycle including the next phase. This is the preferred model for high-risk projects. This model can be used for development as well as enhancement projects. In this model[5], presenting a sequence of activities with some techniques from one activity to the other.
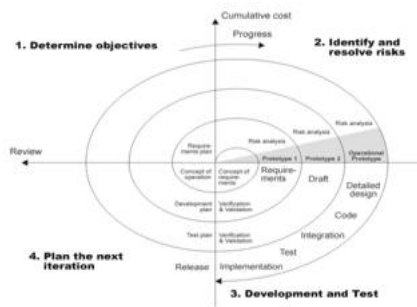

Figure: Spiral model

V-Model:

This is one of the software development model which concentrates more on verification and validation. Similar to the waterfall model, it also have the series of steps in development of an application. Every phase should finish before going to the other phase. When coming to the testing, it is also having another testing V-Model which parallelly have the different operations for testing.

Initially, in the V-model it creates system test plan and according to that all the process will complete. This step is somewhat different with the waterfall model. This test plan mainly focuses on the requirements and checks whether all the functional requirements are achieved or not.

Another phase is High-level design which concentrates on designing part of the application. This design will be had with the help of different UML tools. The diagrams used here are class diagram, sequence, use case, activity etc. It also shows the types of relations that exist in the application.

Low level design mainly concentrates on the implementation of the functional specifications. Logic is reperesented in the low level design and also concentrates in creating the logical components of the application.

Finally implementation, which is coding where the design part is converted to implementing the requirements.

V- Model will be used when the application is of medium sized or small sized. All the requirements should be finalized initially. This model can be implemented when we are having total technical resources on hand like software, skilled people etc.

Advantages of V-Model:

- Main advantage is, completing the testing before starting the implementation. So that so many resources will be saved in implementing the system.

- It helps in tracking the defects in the application. This model is very simple and flexible to use.

Use of V-model makes the clients more flexible in implementing the requirements. It is best suited for small and medium sized applications. It is even having its own testing model where it will be implementing all the activities parallelly. Most of the developers are concentrating on the use of V-model.
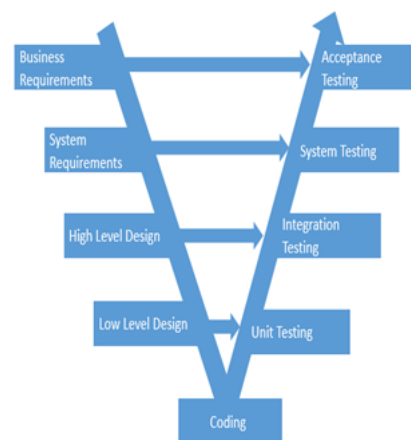

Figure: V-Model

AGILE MODEL:

This model is similar to the incremental model, where the developed application will be released as small releases one after the other. Before releasing every version, it will be tested thoroughly and ensure the quality in the application, then only it will be releasing the application. This model is implemented when there it typical time constraints.
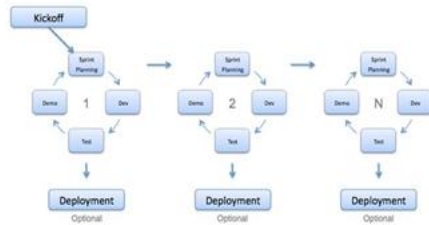

Figure: Azile model

Advantages of Agile model:

* By using this model Customers will have greater satisfaction because of providing rapid, continuous delivery of useful software.

* Here interaction among the people are encouraged instead of having the interaction with the process and tools. This requirement makes the model very competent.

* Frequently version of the applications are released.

* Different types of communication will be had in this like Face-to-face conversation, interviewing, surveying etc.

* Close, daily cooperation between business people and developers.

* Continuous attention to technical excellence and good design.

* Regular adaptation to changing circumstances.

* Changes can be accommodated in the late stages in the development process.

Future scope of the Azile Model:

As the traditional models which came centuries back are not meeting the current needs of the software development process. Now people are looking to a new model which satisfies their needs. Azile model is taking that place and as an example Microsoft is looking for the improvement of the Azile model.

As per the review which I had that future development process may not lead by Azile model but it will be promoting the future development. One has to remember while implementing the Agile model is to doing the things in right way or else the impact or the essence of Azile model will go off. It reduces the speed of development which makes us to do the application again and again. For implementing Agile model Expert people are required and immediate feedback of the implementation is necessary.

III.   CONCLUSION

This paper mainly concentrated on the software engineering models. As to implement any of the application, it should be implemented with the model. But to know which model will be suitable for our application will be understood by the given information in the paper. It covers most of the engineering models and their advantages. Developers or clients can come to a conclusion so that which model will be suitable for their requirements.

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