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Analysis And Comparison With Modern Software Development Approaches

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Abstract

Software Development Life Cycle (SDLC) is a process used by the software company to design, implement and test high-quality software products. The SDLC aims to produce high-quality software that fulfills customer expectations within times and cost estimates. There are different software development life cycle models like waterfall, prototype, spiral model, RAD model, agile model, which specify and design software. Each of these models has its own pros and cons. The main aim of this research paper is to show which process model is the best to develop a high-quality software product and make a comparison between them so that developers can decide which models are best to develop software within thetimelineandcost-effective. Keywords: SDLC model, software process model, Waterfall, Agile, prototype, RAD, Spiral, Software Development Process Models

1. INTRODUCTION

Software Development Processes is a set of activities for analyzing, designing, implementing, and testing software products. A software process model is an abstract representation of a process that aim is to develop of good quality product, a product that is reliable, within an estimated budget, and within a given time framework. It presents a description of a cycle from some specific viewpoint.

The software development life cycle (SDLC) is a process that is used to develop a high-quality software product**[6 Ashish Kumar Gupta at all]**.

- SDLC is a step by step procedure that is followed by the organization to design and develop a high-quality software. These models are also called as "**Software Development Process Models**."
- The Software can be dividing into the following activities:
- Software specification/requirements engineering
- Software design and implementation
- Software verification and validation
- Software evolution/maintenance

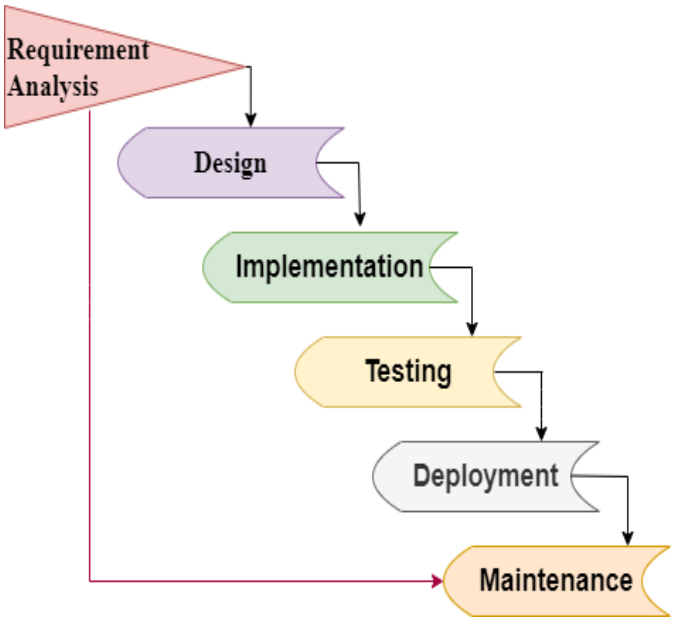

Figure 1. Software Development Life Cycle

The above activities are a part of software development and they are performed in every software development model.

This paper will provide a summary of the latest development process model and make a comparison with them that show the features of each model. In addition, the paper will discuss how these development processes can be used to develop high-quality products within the timeline and cost-effectiveness.

II. TYPES OF SOFTWARE PROCESS MODEL

Various kinds of Software Process Development Models are:

1. Waterfall model
2. Prototype model
3. RAD model
4. Spiral model
5. Agile model

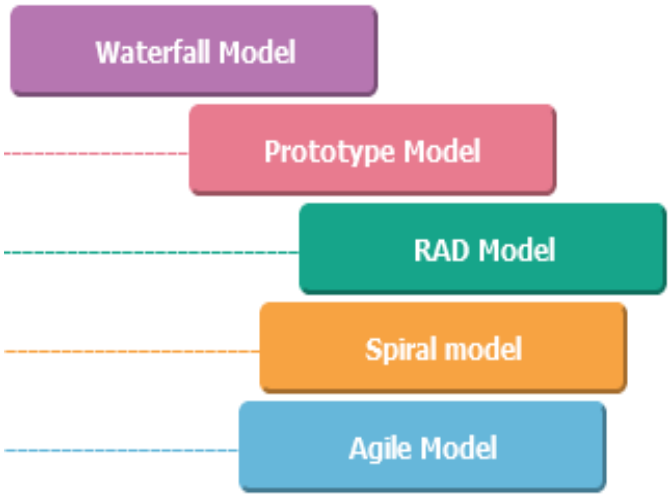

Figure 2. Software Process Development Model

2.1 Waterfall Model:

The Waterfall Model was the first Process Model to be developed by Winston W. Royce in 1970**[7 Manzoor Ahmad Rather at all]**. Waterfall Model is a linear-sequential approach that divides the process of the project into separate phases. This model is easy to understand and use. Prior this model was well known but nowadays it is not used. But yet it is very important because all the other Software Development Process Models depend on the classical waterfall model.

In this model, the entire process of development is divided into independent stages. Each stage should be finished before the next stage can begin with no overlap between the stages that are the result of one stage acts as the input for the next stage sequentially.

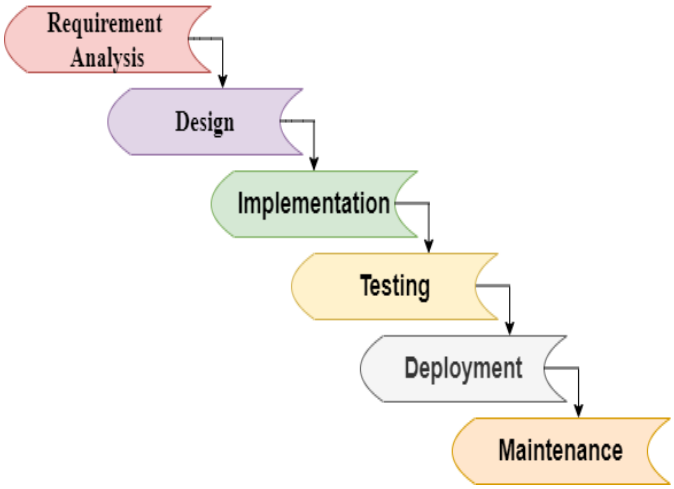

Figure 3. Waterfall Model

2.2 Prototype Model:

Prototyping Model is a software development model in which the prototype is built, tested, and reworked until an acceptable prototype is achieved. It also creates a base to produce the final software product. A prototype is a proof of concept for the product. In the prototype model, users gather the first requirement from the client and then develop a prototype as per their requirements. Client review it to see whether it meets its expected requirements**[8 Prateek Sharma at all]**.

These are persistently displayed to the client so any new changes can be refreshed in the prototype. This cycle proceeds until the customer is happy with the system. Once a customer is satisfied, the prototype is converted to the actual system with all considerations for quality and security.

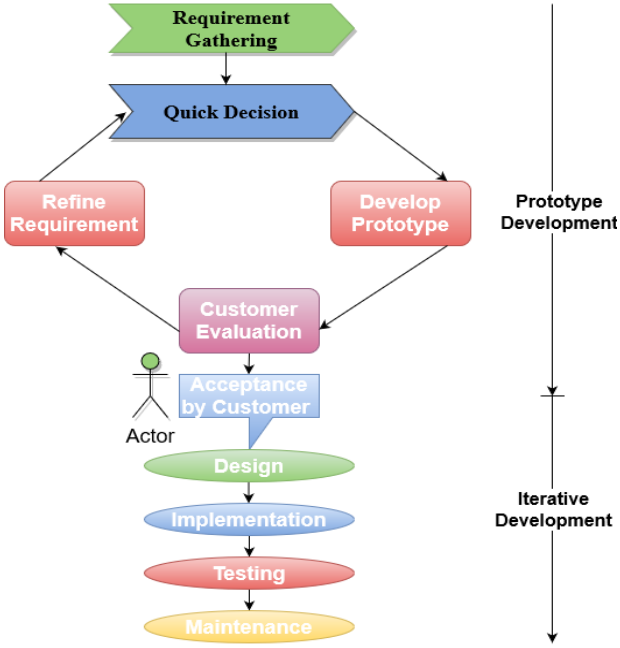

Figure 4. Prototype Model

2.3 RAD Model:

RAD model represents the Rapid Application Development model**[8 Prateek Sharma at all]**. RAD model was first presented by IBM in 1980. In the RAD model, the project divides into small modules like Module1, Module2, Module3, and many more as shown in Figure 4 below. RAD is a linear sequential software development process model that emphasizes the development cycle using an element-based construction approach. This model uses powerful software development tools and techniques. The project can be separated into little modules wherein every module can be assigned autonomously to separate teams and afterward these modules can at last be combined to shape the final product.

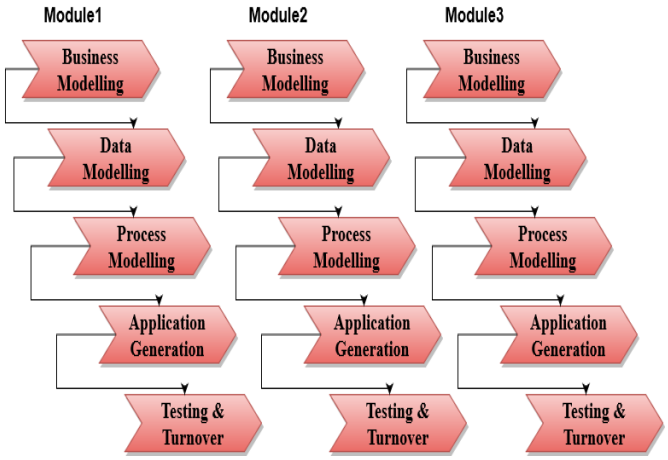

Figure 5. RAD Model

2.4 Spiral Model:

Spiral model is one of the most important Software Development Process Models. This model was first presented by Barry Boehm**[8 Prateek Sharma at all]** in 1986. This model is a mixture of the iterative development process model and sequential linear development model. The spiral model has four phases as Planning, Risk Analysis, Engineering/Development &Testing, and Evaluation. A project over and over goes through these stages in cycles called as Spirals. The spirals model allows the customer to evaluate the output of the project in the last phase before the project continues to the next spiral. Costumers evaluate the software and provide their feedback and approval and then at the end they plan for the next phase is started.

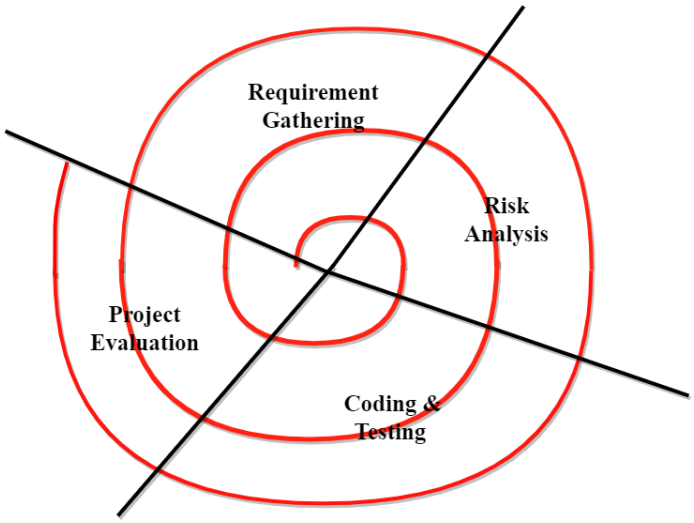

Figure 6. Spiral Model

2.5 Agile Model:

Agile is one the most popular process development model for software development which was developed in 2001. It is widely used in software development companies nowadays. It is a software development mythology that produces high-quality and efficient software. The aim of agile development is to speed up software development with take care of the feedback of customers with development progress.

In the Agile process, the project divided into a small part called as sprint. A sprint can be a module or feature of the system. During a sprint, the development team can decide a number of days for the sprint like 2 weeks or 3 weeks depending on flexibility. This could include the designers, analysts, software engineers, programmers, testers, and so on. There is a scrum master or we can say product owner who is responsible for completing sprint goals with sprint timeline. Before the start of every sprint, the scrum master prepares detailed plans for the development team to achieve all deliverables on completion of the sprint. At the start of the sprint, the development team well aware that what will be outcome at the end of the spring. Every day before start work, the scrum master takes a stand-up call with all team members to make sure that everything is on track.

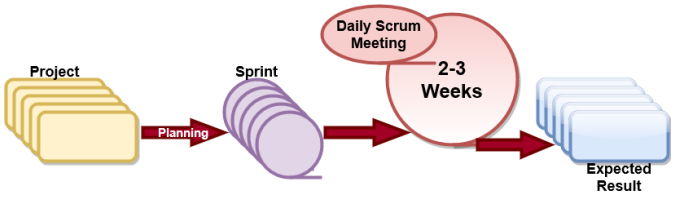

Figure 7. Agile Model

III. COMPARISON BETWEEN VARIOUS SDLC MODELS

Table 1: Comparison of SDLC Models

Features	Waterfall Model	Prototype Model	RAD Model	Spiral Model	Agile Model
Suitable	Small project	Low to Medium Project	Large Scale	Large Scale and Complex	Large Scale and Complex
Simplicity	Simple	Moderate	Complex	Complex	Simplest
Requirement Understanding	Beginning	Not good understanding beginning	Beginning	Beginning	Beginning
Testing	After coding phase Completed	After every prototype model	After complete module	At the End of Engineering Phase	At the End of sprint
Customer Involvement	Low, only at beginning	Intermediate	High	High	Very High
Risk Involvement	High	Low	Low	Low	Very Low
Cost	Low	High	High	Expensive	Expensive

IV. CONCLUSION

This paper provides a summary of the latest process development model for developing a high-quality product. In this paper, we have tried to clarify which process model is best to develop a product with a timeline and cost-effective. This model enhanced control over large or complex projects. One of the biggest advantages of the SDLC model is that it speeds up software development with the feedback of customers.

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