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**SOFTWARE DEVELOPMENT LIFE CYCLE METHODOLOGIES**

Software development cycles or methodologies are a series of stages or steps though which a software application, passes through in a series of recurrences to reach a desired outcome. Methodologies are repeatable processes you can reuse as many times as necessary with a strong likelihood of delivering successful results if applied correctly. We can also customise a methodology according to the problem statement as and when required. These methodologies provide a faster way to deploy solutions because it is consistent, repeatable and systematic.

**SELECTING THE RIGHT SDLC METHODOLOGY FOR A GIVEN PROJECT:**

Selecting the right SDLC is a process in itself that the organisation can implement internally or consult for. There are some steps to get the right selection.

1. Learn about the SDLC Models, their use-cases and properties in depth.
2. Assess the needs of the Stakeholders.
3. Define the criteria or arguments like the suitable team size, apt technology to use, concerns and priorities of the customer, the geographical situations, complexity of the software, engineering capacity and risk insurances with respect to the project.
4. Optimize and finally decide on the suitable model to implement.

**Various SDLC Methodologies**

1. Waterfall Model:

It is a traditional methodology. It is a sequential and liner flow for the developing a software application. Process is defined by finite stages, each of which must be completed before moving on to the next one.

**Order of sequence:** Requirement analysis -> Design-> Execution-> Testing-> Release

* **Advantages:**
* Structured and easy to follow.
* Well-defined and includes proper planning if the project.
* Specific deliverables at each stage of the process.
* **Disadvantages:**
* Unyielding and complex to trace back to the prior stage after it has ceased to completion.
* Relatively more expensive.
* More time consuming.

1. Prototyping Model:

This methodology creates software application prototypes to simulate the functional aspects of a desired final product. It is generally used to visualise software solution components and matching them with costumer requirements. There are 2 subtypes within it, throwaway and evolutionary.

**Order of sequence:** Requirement analysis -> Design-> Prototype-> Evaluation-> Refined prototype-> Testing-> Release

* **Advantages:**
* Any change in requirements can be easily accommodated in this model.
* Reduced cost and time of development as potential risks are identified in the prototype itself.
* Any requirement confusion can be easily sorted, since the involvement of the customer in this model is direct.
* **Disadvantages:**
* Since the customer is involved in every phase, they can keep altering their requirements continuously, which in-turn increases the complexity and delivery time.

1. Spiral Methodology:

This model mainly focuses on risk identification. The developer identifies potential risks and their solution is implemented. Later a prototype is created to verify the risk coverage. Risk-driven process model. It is a technique of rapid prototyping and concurrency in design and development activities. Each cycle in the spiral begins with identifying the objectives of that cycle. The next step in the cycle is to evaluate the different alternatives based on the objectives and constraints. The final step is to develop strategies to solve for those particular risks and uncertainties.

**Order of sequence:** Planning-> Risk Analysis-> Engineering-> Evaluation-> Planning….

* **Advantages:**
* Risk analysis done here reduces the scope of risk occurrence.
* Any requirement change can be accommodated in the next iteration.
* Very viable for large projects.
* **Disadvantages:**
* Model is best suited only for large applications.
* Cost can raise up significantly high as it takes large number of iterations to reach the final product.

1. Rapid Application Development:

RAD methodology helps to get high-quality results. It is more of an adaptive process. It accelerates the entire development process.

**Order of sequence:** Requirement planning-> User design-> Construction-> User design-> Construction…...->Cutover

* **Advantages:**
* Helps the customer to take a quick review of the project.
* A product that continuously interact with the evolving prototype.
* Encourages feedback from a customer.
* **Disadvantages:**
* Model cannot be used for smaller projects.
* Requires experiences developers to handle complex situations.

1. Rational Unified Process Methodology:

RUP methodology follows the iterative software development process. Its an OOPS and Web enabled method. It is created by rational corporation and is designed and documented using UML (Unified modelling language). It follows an iterative process, and provides a prototype at the end of each iteration.

**Order of sequence:** Inception Phase-> Elaboration Phase-> Construction Phase-> Transition phase

* **Advantages:**
* Adaptive to changing requirements.
* Focuses on accurate documentation.
* Since, within the dev phase, there is integration going on, there is no need for separate integration process.
* **Disadvantages:**
* RUP method requires high experienced developers.
* It might lead to slight confusions in the testing phase.
* A complicated model.

1. Agile Software Development Methodology:

It is an approach that is used to develop software in an iterative and incremental manner that allows frequent changes in the project. In agile, rather than focussing on requirements, the emphasis is on flexibility and an adoptive approach.

* **Advantages:**
* Changes in requirements can be easily accommodated.
* Customer satisfaction and feedback is taken at every stage.
* **Disadvantages:**
* Lack of documentation as the focus is on the real working model.
* If the customer is not clear about what exactly they require In the project, the model would fail.

1. Scrum Development Methodology:

It is an iterative and incremental agile software program framework. It is more time-based and planned method. Best suited for projects in which requirements aren’t clear and keeps changing. Scrum is organised by scrum master, who helps to successfully deliver the Sprint goals. In scrum, the backlog is defined as the work to be done as a priority. The backlog items are completed in small sprints the last 2-4 weeks.

* **Advantages:**
* Decision-making is completely in the hands of the team.
* Daily team meet-ups helps the developer know the productivity of the individual team members.
* **Disadvantages:**
* Not suitable for small-sized projects.
* Needs highly experienced resources.

1. Lean Development Methodology:

The lean development methodology is a method that is used in software development to decrease cost, effort, and waste. It helps in developing software in 1/3rd of the time when compared to other methodologies. Budget constraints can also be satisfied.

**Order of sequence:** Map the value system-> Create flow-> Establish pull-> Seek perfection-> Identify value

* **Advantages:**
* Low budget and efforts.
* Less time-consuming.
* Deliver the product very easily when compared to other methods.
* **Disadvantages:**
* The success of development depends entirely on the team’s decisions.
* As the developer is flexible to work, it can also lead to losing his focus.

1. Extreme Programming Methodology:

Also known as XP methodology. Used to create a software system wherein the requirement is not stable. Any change in the later stages leads to high cost for the project. Requires more time and resources to complete. It provides iterative and frequent releases throughout the SDLC phases of the project.

* **Advantages:**
* Emphasis is on the costumer involvement.
* It delivers a high-quality product.
* **Disadvantages:**
* Requires meetings at frequent intervals.
* Increases cost to the customers.
* Development changes are too much to handle every time.

1. Joint Application development methodology:

The joint application development methodology involves the developer, end-user, and clients for meetings and JAD sessions to finalize the software system to be developed. This methodology provides customer satisfaction as the customer is involved throughout the development phase.

**Order of sequence:** Planning-> Session preparation-> Design session-> documentation

* **Advantages:**
* The quality of the product is improved.
* Team productivity increases.
* Lowers the development and maintenance cost.
* **Disadvantages:**
* Takes an excessive amount of time for planning and schedule.
* Requires significant investment of time and effort.

1. Dynamic System Development Model Methodology:

Dynamic System Development methodology is based on the RAD method. It uses an iterative & incremental approach. DSDM is a simple model that follows best practices to be implemented in the project.

**Techniques used in DSDM:**

**Timeboxing:** This technique is of 2-4 weeks of the interval. In exceptional cases, it goes up to 6 weeks also. A disadvantage of a longer interval is that the team can lose focus. At the end of the interval, the product has to be delivered. It can contain several tasks.

* **Advantages:**
* Iterative and increment approach.
* Decision-making power to the team.
* **Disadvantages:**
* Not good for small Organizations as this technique is costly to implement.

1. Feature-Driven Development:

FDD also follows an iterative & incremental approach to delivering the working software. The feature is a small, client-valued function. **E.g.,** “Validate the password of a user”. The project is divided into features.

**Order of sequence:** Develop an overall model-> Build a feature list-> The plan by feature-> Design by feature-> Build by feature

* **Advantages:**
* Scalability of FDD to larger projects.
* It is a simple methodology that can be easily adopted by companies.
* **Disadvantages:**
* Not suitable for smaller projects.
* No written documentation provided to customer.