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Software Engineering:

is the process of application of processes, steps, models disciplines and practical approaches for the development of software, their management and operations.

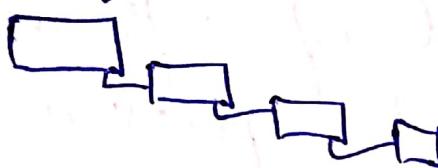
Principles of Software Engineering

- (i) The reason it all exists
- (ii) KISS
- (iii) Vision
- (iv) Thing you will produce will be consumed by other
- (v) Open to Future
- (vi) Reuse of code
- (vii) Think!

Q Models → prospective Model

Waterfall Model

- ⇒ also referred as classic model
- ⇒ activities are carried in a sequential manner
- ⇒ starts from customer req → plan, const, design and



No reverse, No feedback at each phase

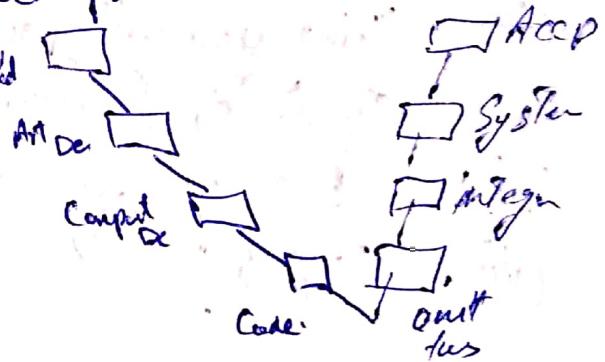
V-Model

variation of waterfall model

Validation & verification model

Testing is done at each phase

lowers the risk



→ Incremental Model

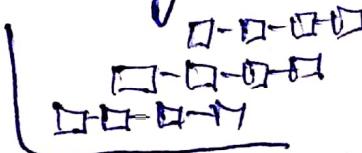
whole model is divided into phases

SDLC practices applied on each phase

sequential and parallel processes

Each increment is capable of producing result

Later each increment is integrated to form s/w





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=> Evolutionary Model / Iterative Model

Similar to WF model

Diffr is that a feedback component is added at each phase

Helps in alleviation of limitation at each phase

Feedback => users, developer

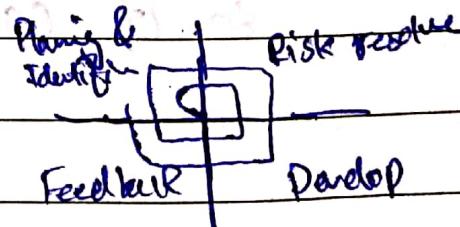
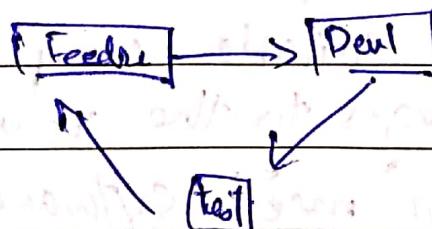
Helps reduction in risk as risk at every phase is analyzed and removed

(i) Prototyping

=> Development or replication of the proposed software

=> Don't provide the complete functionality and purposes of final evaluated prod.

=> Feedback is taken & necessary changes implemented



(ii) Spiral

=> Risk Handling

=> Each loop reps phase

=> Greater radius Greater cost

=> Phases varies acc to proj

Q Component B

Specialized Process Model

=> they uses characteristics of traditional model and are used for development of specialized project

(i) Component-Based Development

=> includes development of software using reuse of components and classes

Activities

(i) Component Qualification

Component that reusing gives value to system. Identify its interface with system.

=> validation of component

(ii) Component Adaptation

Component that is reused is either adjustable in proj underdevelop

=> selecting suitable component or make changes to the reused component so it can meet software requirements.



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⇒ Formal Methods Model

Includes techniques and mathematical methods that are used for the development of highly complex software.

2-Steps

⇒ Property Based-Specification

includes two elements

- * Operation that can be performed on system
- * Relationship b/w the operations

⇒ Model-Based Specifications

includes two elements

- * Current state of system
- * how operation can transfer from state to state.

Q Testing Techniques

Def Testing

Divided into two categories

(i) Functional Testing

Testing while development phase & testing for business requirement

(ii) Non-Functional Testing

Testing after completion of system to test performance, security etc.

Functional Testing

=> Unit Testing

- * First lvl testing
- * Performed by developer
- * Testing to check functionality of developed unit
- * Make debugging easier, testing done at small code unit

=> Integration Testing

=> After unit tests, units are integrated to form applicatv

=> Integration test is to test modules integrate are working properly

=> Testing through diff scenarios & inputs.



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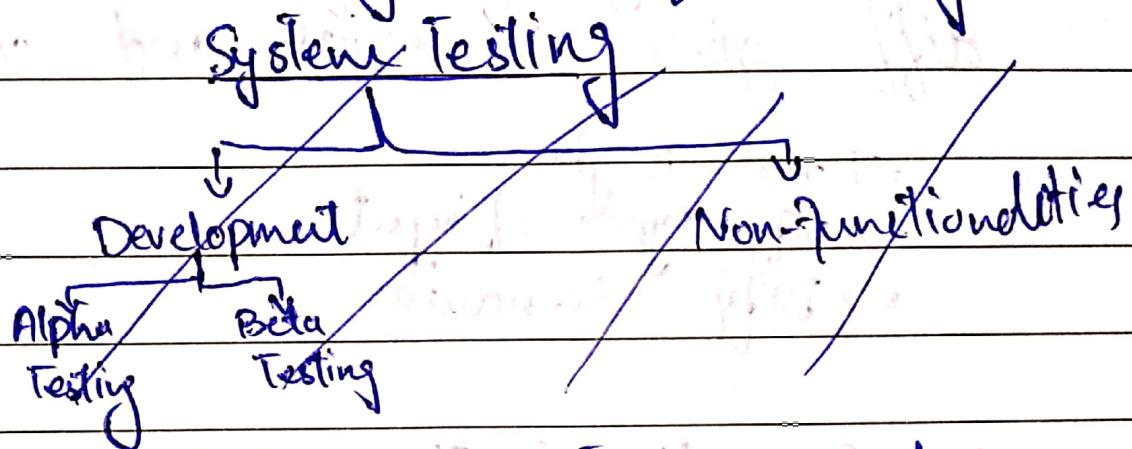
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⇒ System Testing

⇒ System Testings used to evaluate the overall system after integration



⇒ Conducted by separate testing teams

⇒ End to End system testing

⇒ Is Black Box Testing

includes testing of functionality without analyzing the implementation

⇒ Acceptance Testing

⇒ last testing phase

⇒ used to evaluate the system is ready to be believed

⇒ Includes Alpha-Testing & Beta-Testing

Non-Functional Testing

Testing after the development of product.

(i) Performance Testing

Testing of software under diff given scenarios and conditions.

=> Load is given

=> Diff types of input

=> Diff scenarios

(ii) Security Testing

As computing-cloud Technology increases, increased risks of cyber attacks
Testing performed to insure security

Includes

Integrity testing

Confidentiality

Authorization

Authentication



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Q: Agile Process Model

⇒ Iterative Model

⇒ Divided in phases

⇒ That reduces the risk in long term planning

⇒ SDLC activities applied at each phases.

Phases of Agile Process Model

- (i) Requirement gathering (analysis)
- (ii) Designing the Req (planning)
- (iii) Construction (coding)
- (iv) Testing & Deployment
- (v) Feedback

Agile Testing Method

DefTesting

Methods

Scrum ⇒ (Testing to check ability of software to execute)

XP ⇒ (complex problem and complicated process)

Test-Driven Development ⇒ includes testing at each phase

Feature-Driven Development ⇒ includes testing of each developed function.

Q

Eliciting Requirements

is the process of gathering info about the proposed or intended project that includes steps, processes, plans by communication with clients, end users, resource provider and stakeholders.

Methods

4 Methods

(i) Collaborative Req Gathering

Many different methods of Req gathering have been proposed.

- Meetings are arranged b/w S.E & customers
- Rules for preparation and participation are established
- A facilitator arranges the meeting

(ii) Quality Function Deployment

is the process of converting users need into technical software requirements. It includes maximizing the customer satisfaction through E processes.



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- Normal Req

They includes goals and objectives their are mentioned by customer on meeting with dev teams

- Expected Req

The req that automatic includes in system req, they are so basic that they are not expressed by customer

- Exciting Req

The req that are added up in the software that are beyond customers expectation and also delightful when presented

(iii) Usage-Scenario

In order to understand how diff functions and features will be used by different types of end-users, the client and developers collaborate and establishes set of scenarios that shows how a system will behave in specific condition.

Work-Product

The work product that is constructed depends upon the size of project/product.

Work-products includes

- A need and feasibility statement
- System's or product's scope statement
- A list of customers, user and stakeholders that take part in eliciting requirement
- A description of system environment.



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Q Requirement Modeling Strategies

Two types of strategies are used

- (i) Flow-oriented Modeling
- (ii) Class-based Modeling

Flow-oriented Modeling

It represents how objects are transformed by processing information

- Data-flow Model

Includes rep of flow of data among diff obj

Also represent the change due to processing info

- Control-flow Model

includes representation of flow control within objects and classes.

It doesn't include flow of data

- Control Specification

represent overall behaviour of system

↳ how system behaves in diff scenarios

- Process Specification

represents overall flow model

uses PDL, algo, mathematical eqs etc

Class-based modeling

represent use of classes for development.
How they manipulate and co-operate

Analysis of classes

- (i) External Entities: includes people, how are source
- (ii) Thing: includes data, info, letters that are part of info domain
- (iii) Roles: Manager, stakeholder, developer, clients
- (iv) Org's unit: Teams, groups for development

Attributes

defines the class that have been selected by our modeling for its implementation in proj domain
It also identifies that what is purpose of classes in a given scenario

Operation

Operation defines behaviour of class/object
⇒ Characterized in following types

- The operation manipulate data like (adding, deleting, modifying)
- The operations performs a computation
- The operations monitor the object for the occurrence of an event and its controlling



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9 Requirement Modeling for web apps.

Req Modeling Stages

- (i) Analysis (ii) Input (iii) Output (iv) Content Model
- (v) Interaction Model (vi) Navigation Model
- (vii) Configuration Model

Analysis

includes gathering info about proj

Once all info is specified you can develop

case study on proj

=> Size of web apps => Complexity

=> Function

=> Scope

Input

After gathering info through req modeling, the next step is to develop strategies for development purpose

The basic purpose is to develop a structure and req modeling provides a brief str for proj

For agile dev, after complete analysis of Req and, the team is divided into pairs

Output

Output is the prod developed by the developer.
Rear modeling provides the complete interface, necessary components
and infra str for the finalized app development.

Models for web apps

↳ Models in which a webapp resides

- Content Model
- Interaction Model
- Navigation "
- Functional "
- Configuration "



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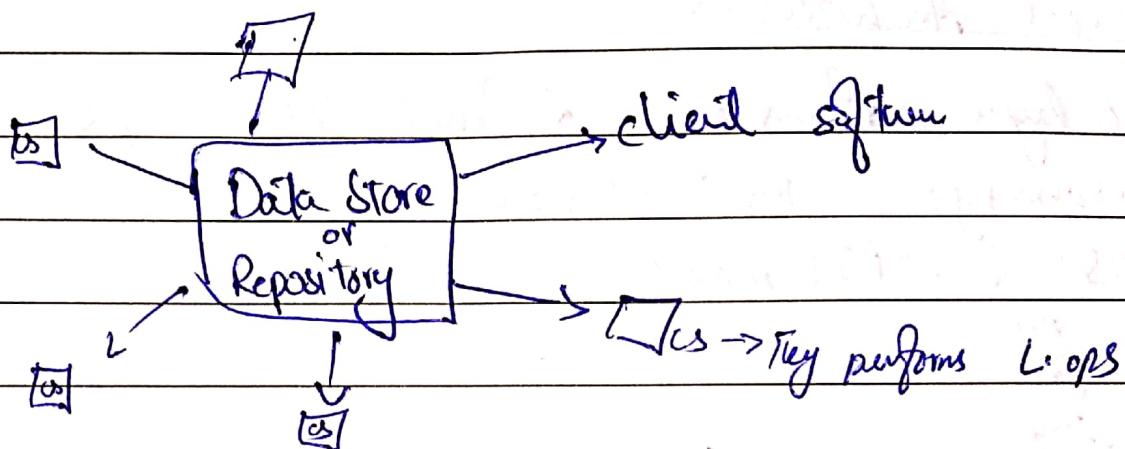
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Q Architectural Styles of Softwares

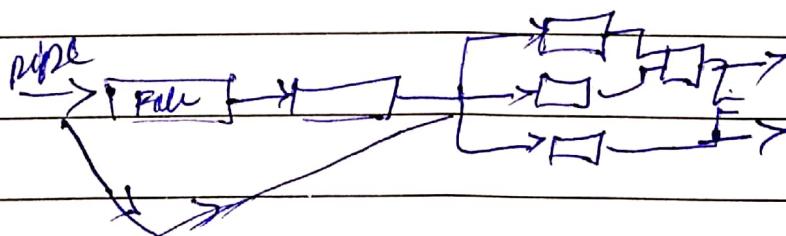
(i) Data-Centred Arch



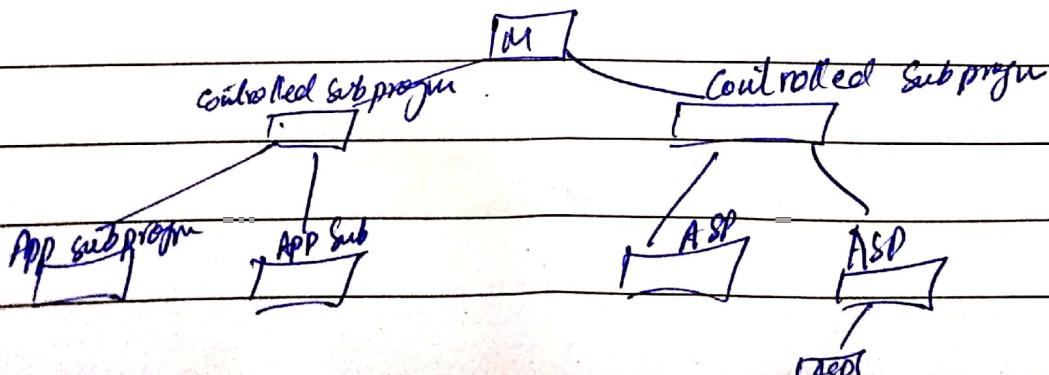
(ii) Data-Flow Architecture

Pipe & Filter Architecture

⇒ For single input & multiple output



(iii) Call-&-Return Archit



Object Oriented Design

Object Oriented Architecture

↳ Classes & Object

Layered Architecture

each layer performs well-defined sets of ops
Layers arrange in hierarchical manner.
OSI & TCP/IP model.





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Q Explaining Real Modeling

Real Modeling

Element of Real Modeling

- ⇒ Scenario-Based Modeling
- ⇒ Behavioral Modeling
- ⇒ Flow-oriented Modeling
- ⇒ Class Based Modeling

Analysis Pattern

↳ certain problems reoccur in all application dev under certain domain

↳ Analysis pattern are integrated into analysis model by way of pattern name .

They are also stored in repository so that real engg use and apply them .



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Class-Based Component Based Design

designing software components using class or classes.

Principle

Modular: each component have specific functionality and can be used in various ways

Cohesive: are meant to address goals, and every other integrated component helps them in achieving goal.

Reusable: Not designed for one project, they are used to design another

Well document: Complete documentation, application lifecycle and results. So anyone using will know complete.