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SEMESTER / BRANCH: V/COMPUTER Engineering

SUBJECT: Software Engineering **(CSC502)/ First Assignment**

Date: 19-08-23   Due Date : 25-08-23

CSC502.1: Recognize software requirements and various process models. (Understanding)
CSC502.2: Develop project Plan, schedule and track the progress of the given project (Applying)

Questions :

1. What is the significance of recognizing software requirements in the software engineering process?
2. Describe the main characteristics of different process models used in software development.
3. How does the Capability Maturity Model (CMM) contribute to improving software development processes?
4. Explain the differences between prescriptive process models and evolutionary process models.
5. Provide examples of situations where using a specific process model would be more suitable.
6. Compare and contrast the Waterfall model and Agile methodologies in terms of project planning and progress tracking.
7. Apply process metrics to evaluate the efficiency and effectiveness of Waterfall , Agile (both Scrum & Kanban) methodologies, considering factors such as development speed, adaptability to change and customer satisfaction.
8. Justify the relevancy of the fallowing comparison for software development models.

Features	Water fall Model	Incremental Model	Prototyping Model	Spiral Model
Requirement Specification	Beginning	Beginning	Frequently Changed	Beginning
Understanding Requirements	Well Understood	Not Well Understood	Not Well Understood	Well Understood
Cost	Low	Low	High	Expensive
Availability of reusable component	No	Yes	Yes	Yes
Complexity of System	Simple	Simple	Complex	Complex
Risk Analysis	Only at beginning	No risk analysis	No risk analysis	Yes
User involvement in all phases of SDLC	Only at beginning	Intermediate	High	High

Guarantee of Success	Less	High	Good	High
Overlapping Phases	Absent	Absent	Present	Present
Implementation Time	Long	Less	Less	Depends on Project
Flexibility	Rigid	Less flexible	Highly flexible	Flexible
Changes Incorporated	Difficult	Easy	Easy	Easy
Expertise Required	High	High	Medium	High
Cost Control	Yes	No	No	Yes
Resource Control	Yes	Yes	No	Yes

Rubrics :

Indicator	**Average**	**Good**	**Excellent**	**Marks**
Organization (2)	Readable with some mistakes and structured (1)	Readable with some mistakes and structured (1)	Very well written and structured (2)	
Level of content(4)	Minimal topics are covered with limited information (2)	Limited major topics with minor details are presented(3)	All major topics with minor details are covered (4)	
Depth and breadth of discussion(4)	Minimal points with missing information (1)	Relatively more points with information (2)	All points with in depth information(4)	
Total Marks(10)				

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Assignment - 1

1) As the technology changes, the user requirements and environment on which software is working also changes. So every organization is ranked based on the software engineering principles used by that organization.
Implementing and managing large size of software programmer requires a specific method modularize the tasks so that ~~•~~ size of software cant harm the software quality.
Software engineering provides methodology for implementing complex ~~co~~ software systems with high quality.
Without any standard method or management, it is difficult to address defects in the product and correct them as early as possible. Software engineering provides this functionality. Extending the previous software to add new functionality requires more cost in terms of time to develop and efforts taken by people, as compare to the process of developing new software to provide that functionality.
Software engineering provides a way in which software system can be able to scale as needed in future.

2)* Waterfall model - Sequential and linear approach.

- Each phase must be completed before morning to the next one.
- Clear and structured, suitable for projects with well-defined requirements, minimal changes and stable scope
- Limited flexibility for changes, difficult to adapt to evolving requirements, potential for late-stage errors discovery.

* V-model (validation and verification model):- Parallel development and testing approach. Each development phase is followed by a corresponding testing phase.

- Strong emphasis on validation and verification, clear documentation, reduces risk by identifying issues early.
- Limited adaptability to changing requirements, potential for miscommunication between development and testing phases.

* Incremental model - Similar to iterative models, but the software is built in increments, each delivering specific functionality.

- Early delivery of functional modules, reduced time to market, allows for better integration testing.
- Requires careful planning to define increments, possible integration challenges

* Iterative model - Similar to agile, but with more structured and defined phases. Each iteration may include a subset of the software's functionality.

- Allows for iterations, refined features, and early feedback, suitable for projects with evolving requirements.
- Requires clear planning and coordination between iterations, potential for scope creep.

3) The ~~CMM~~ cmm models application in software development has sometimes been problematic. Applying multiple models that are not integrated within and across an organization could be costly in training appraisals, and improvement activities.

- The capability maturity model integration (CMMI) project was formed to sort out the problem of using multiple models for software development processes, thus the CMMI models has superseded the cmm model, though the cmm model ~~has suspended~~ continues to be a general theoretical process capability model used in the public domain.
- CMMI framework consists of a collection of computer programs based on knowledge, engineering, software engineering, integrated product and process development and provider sourcing.
- CMMI framework has three groups as:

1. CMMI for development (CMMI - DEV)
2. CMMI for service (CMMI - SVC)
3. CMMI for acquisation (CMMI - ACQ)

4) Prescriptive Process Model	~~Evolution~~ Evolutionary process model
Developed to bring order and structure to the software development process.	stages consists of growing increments of an operational software product with evolution
It can accomadate changing requirement.	Improvement is required in the product
It is more popular	It is less popular
waterfall model and incremental models are a few examples of prescriptive process model.	eg: Spiral & prototypying model as well as RAD model.

5) Incremental model - when a project can be divided into smaller functional increments, allowing certain modules to be developed and delivered independently while ensuring integration and testing along the way.

- RAD model - When there is a need to quickly produce a working prototype to gather user feedback and make refinements before proceeding with full development.
- Waterfall model - When requirements are stable and changes are minimal, making it possible to plan and execute the project in a linear sequence of phases.
- Agile model (Scrum) - When flexibility and adaptability are crucial and the project can be divided into smaller increments with frequent iterations, allowing for continuous feedback & changes.

6) Waterfall model is the first approach used in software development process. It is also called as classical life cycle model or linear sequential model.
In waterfall model any phase of development process begins only if previous phase is completed.

- Agile software development describes an approach to software development unclear. which requirements and solutions revolve through the collaborative effort of self-organising & cross functional teams and their customers.
- It advocates adaptive planning, evolutionary development, early delivery, and continual improvement, and it encourages rapid and flexible responses to change
- The term agile was popularized, in this context by. the Manifesto for agile software development.

7) 1. Waterfall
Development speed:

- Waterfall is a linear and sequential methodology where each phase must be completed befere moving on tee next. This can lead to longer development cycles.
- metrics: Time taken for each phase (requirements, design, development, testing, deployment).

Adaptability to change:

- waterfall is less adaptable to changes in requirements due to its rigid structure
- metrics: Number of change requests, impact analysis time and delays caused by change requests.

Customer satisfaction:

- waterfall may have limited customer involvement until the end, which could affect satisfaction.
- Metrics: Customer feedback at the end of the project post-deployment support requirements

2- Agile (Scrum & Kanban):

Development speed:

- Agile methodologies emphasize incremental development, allowing for quicker delivery of working features.
- metrics: Number of user stories completed per sprint or cycle time, velocity.

Adaptability to change:

- Agile methodologies are highly adaptable to changing requirements due to regular iterations & flexibility
- metrics: Number of changes incorporated per sprint / cycle, time taken to respond to change requests.

Customer satisfaction.

- Agile methodologies involve continuous customer feedback and collaboration, leading to improved satisfaction.
- metrics: Regular customer feedback scores, frequency of customer involvement.

8) features	Waterfall model	Incremental model	Prototyping model	Spiral model
Requirement Specification	well understood	not well understood	not well understood	well understood
Understanding requirements	well understood	not well understood	not well understood	well Understood
Availability of reusable components	No	Yes	yes	yes
Risk analysis	Only at beginning	no risk analysis	no risk analysis	yes
User involvement	Only at beginning	intermediate	high	high
Implementation time	long	less	less	depends on project
flexibility	rigid	less	high	flexible
expertise required	high	high	medium	high
cost control	yes	no	no	yes
resource control	yes	yes	no	yes