

Midterm

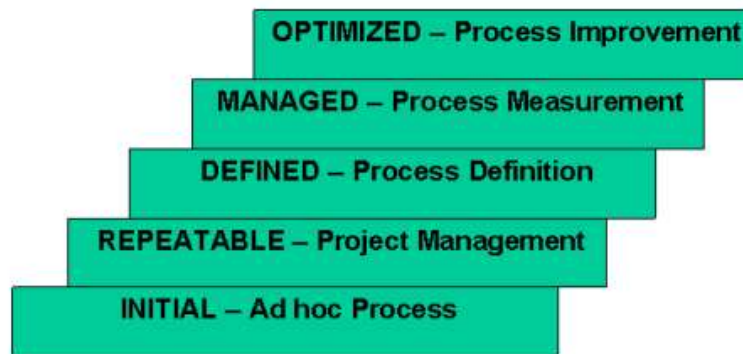
Notes CS605 Software Engineering-II

Solved by Heeru

What is the process maturity and CMM?

Process Maturity and CMM

The Software Engineering Institute (SEI) has developed a framework to judge the process maturity level of an organization. This framework is known as the Capability Maturity Model (CMM). This framework has 5 different levels and an organization is placed into one of these 5 levels. The following figure shows the CMM framework.



Define KPAs for each level?

Level	KPAs
1	No KPA is defined as organizations at this level follow ad-hoc processes
2	• Software Configuration Management • Software Quality Assurance • Software subcontract Management • Software project tracking and oversight • Software project planning • Requirement management
3	• Peer reviews • Inter-group coordination • Software product Engineering • Integrated software management • Training program • Organization process management • Organization process focus
4	• Software quality management • Quantitative process management
5	• Process change management • Technology change management • Defect prevention

Question: What is a lifecycle model?

lifecycle model is a series of steps through which the product progresses. These include requirements phase, specification phase, design phase, implementation phase, integration phase, maintenance phase, and retirement.

What is the Software Development Lifecycle Models?

There are a number of Software Development Lifecycle Models, each having its strengths and weaknesses and suitable in different situations and project types. The list of models includes the following:

- Build-and-fix model
- Waterfall model
- Rapid prototyping model
- Incremental model
- Extreme programming
- Synchronize-and-stabilize model
- Spiral model
- Object-oriented life-cycle models

What is a Spiral model?

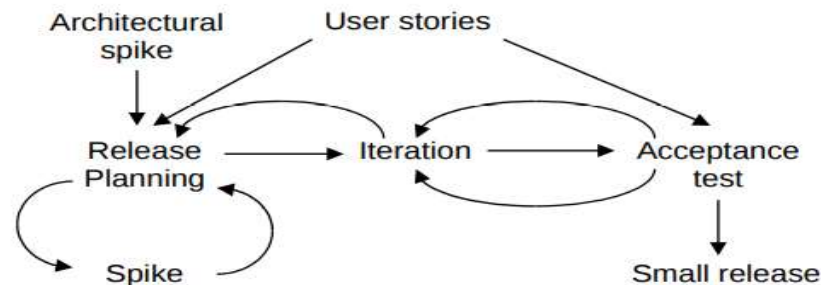
This model was developed by Barry Boehm. The main idea of this model is to avert risk as there is always an element of risk in development of software. For example, key personnel may resign at a critical juncture, the manufacturer of the software development may go bankrupt, etc.

Give two importance of reviews?

- With Technical review you may come to know more about the technical requirements and specifications.
- reviews the process description for compliance with the organizational policies, internal software standards, externally imposed standards, and other parts of the software project plan.

What is the eXtreme Programming?

It is a somewhat controversial new approach. In this approach user requirements are captured through stories which are the scenarios presenting the features needed by the client? Estimate for duration and cost of each story is then carried out. Stories for the next build are selected. Then each build is divided into tasks. Test cases for task are drawn up first before and development and continuous testing is performed throughout the development process.



Why project fail?

1. **changing c**ustomer requirements
2. ambiguous/incomplete requirements
3. unrealistic deadline
4. an honest underestimate of effort
5. predictable and/or unpredictable risks
6. technical difficulties
7. miscommunication among project staff
8. failure in project management

Can you think it is difficult to implement CMM level in the software companies?

The CMM Level where basic project management processes are established to track cost, schedule, and functionality. That is, it is characterized by basic project management practices. It also implies that without project management not much can be achieved. In Small software house

– Project size

As the project size increases, the complexity of the problem also increases and therefore its management also becomes more difficult.

– **Delivery deadline**

Delivery deadline directly influences the resources and quality.

Budgets and costs

A good estimate of budget, cost and schedule is essential for any successful project.

- Application domain

Application domain also plays an important role in the success of a project. The chances of success of a project in a well-known application domain would be much better than of a project in a relatively unknown domain. The project manager thus needs to implement measures to handle unforeseen problems that may arise during the project lifecycle.

Does Software quality depend only on the resource code?

Ans: The quality of the end result depends upon the quality of the intermediate work products. If the requirements, design, code, and testing functions are of high quality, then the chances are that the end product will also be of good quality. So, a good software

Differentiate b/w Democratic decentralized (DD) and Controlled decentralized (CD)?

- **Democratic decentralized (DD)**

In this organization there is no permanent leader and task coordinators are appointed for short duration. Decisions on problems and approach are made by group consensus and communication among team is horizontal.

- **Controlled decentralized (CD)**

In CD, there is a defined leader who coordinates specific tasks. However, problem solving remains a group activity and communication among subgroups and individuals is horizontal. Vertical communication along the control hierarchy also occurs.

How Kraul and Steeter categorize the project coordination techniques?

- Formal, impersonal approaches

In these approaches, coordination is achieved through impersonal and formal mechanism such as SE documents, technical memos, schedules, error tracking reports.

- Formal, interpersonal procedures

In this case, the approaches are interpersonal and formal. These include QA activities, design and code reviews, and status meetings.

- Informal, interpersonal procedures

This approach employs informal interpersonal procedures and includes group meetings and collocating different groups together.

- Electronic communication includes emails and bulletin boards.

- Interpersonal networking includes informal discussions with group members

Differentiate b/w open paradigm and synchronous paradigm in structural paradigms?

open paradigm—attempts to structure a team in a manner that achieves some of the controls associated with the closed paradigm but also much of the innovation that occurs when using the random paradigm

synchronous paradigm—relies on the natural compartmentalization of a problem and organizes team members to work on pieces of the problem with little active communication among themselves

What is W5HH Principle?

Barry Boehm has suggested a systematic approach to project management. It is known as the WWWWWHH principle. It comprises of 7 questions. Finding the answers to these 7 questions is essentially all a project manager has to do. These are:

- **WHY** is the system being developed?
- **WHAT** will be done?
- By **WHEN**?
- **WHO** is responsible for a function?
- **WHERE** they are organizationally located?
- **HOW** will the job be done technically and managerially?
- **HOW MUCH** of each resource (e.g., people, software, tools, database) will be needed?

What is critical practice?

The Airlie Council has developed a list of **critical** success practices that must be present for successful project management. These are:

- Formal risk analysis
- Empirical cost and schedule estimation
- Metrics-based project management
- Earned value tracking
- Defect tracking against quality targets
- People aware project management

The question was to separate the Mandatory and Optional fp?

Usage of **FP** includes:

- Effort Scope Estimation
- Project Planning
- Determine the impact of additional or changed requirements
- Resource Planning/Allocation
- Benchmarking and target setting
- Contract Negotiations

Following is a list of some of the FP based metrics used for these purposes:

- Size – Function Points
- Defects – Per Function Point
- Effort – Staff-Months
- Productivity – Function Points per Staff-Month
- Duration – Schedule (Calendar) Months
- Time Efficiency – Function Points per Month
- Cost – Per Function

Can we count a single logical file as both EIF and ILF for the same application?

Ans: A logical file cannot be counted as both an ILF and EIF for the same application. If the data group satisfies both rules, count as an ILF.

What is EIF?

Answer: - An external interface file (EIF) is a user identifiable group of logically related data or control information referenced by the application, but maintained within the boundary of another application.

Define RET?

A record element type (RET) is a user recognizable subgroup of data elements within an ILF or EIF. There are two types of subgroups:

- Optional
- Mandatory

Optional subgroups are those that the user has the option of using one or none of the subgroups during an elementary process that adds or creates an instance of the data.

Mandatory subgroups are subgroups where the user must use at least one. For example, in a Human Resources Application, information for an employee is added by entering some general information. In addition to the general information, the employee is a salaried or hourly employee. The user has determined that an employee must be either salaried or hourly. Either type can have information about dependents. For this example, there are three subgroups or RETs as shown below:

- Salaried employee (mandatory); includes general information
- Hourly employee (mandatory); includes general information
- Dependent (optional)

Process Driven Approach and Data Driven Approach?

Process Driven Approach

If several entities are always **created** together and **deleted** together then this is a strong indication that they should be grouped into a single logical file.

- A customer PO is a single group of data from a user business perspective.
- It consists of a header and items information.
- From a business perspective, an order cannot be created unless it has at least one item and if the order is deleted both the order header and items are deleted. However the header and the items may have independent maintenance transactions.

Data Driven Approach

Entity Independence: an entity has significance to the business in and of itself without the presence of other entities. This is a logical file.

Entity Dependence: an entity is not meaningful, has no significance to the business in and of itself **without** the presence of other entities. This is an RET.

- Given two linked entities A and B, whether B is dependent or independent:
 - Is B significant to the business apart from the occurrence of A linked to it?
 - If we delete an occurrence "a" of A, what happens to occurrence "b" of B linked to "a"?

Three external input counting rules?

Answer: The data or control information is received from outside the application boundary.

☐☐ At least one ILF is maintained if the data entering the boundary is not control information that alters the behavior of the system.

☐☐ For the identified process, one of the following three statements must apply:

- o Processing logic is unique from the processing logic performed by external inputs for the application.

- o The set of data elements identified is different from the sets identified for other external inputs for the application.

- o The ILFs or EIFs referenced are different from the files referenced by other external inputs in the application.

How do identify the problem?

Answer: measure your process. Measurement helps in identification of the problem as well as in determining the effectiveness of the remedy.

Measurement is fundamental for providing mechanisms for objective evaluation of a process or activity.

What is a good metric system?

The metric system or International System of Units, is the most widely used system of units. It is used for everyday commerce in virtually every country of the world except the United States. It is most accurate. All need the metric system to be good for anything accurate! The argument: "The English system is accurate because the metric system is accurate"

Differentiate b/w Software metric and software Measures?

Within the software engineering domain, a measure provides a quantitative value of some attribute of a process or a product. For example, size is one measure of a software product whereas Software metric relates individual software measures to provide a normalized view. For example, defects per function point are one metric which relates two individual measures, that is, defects and size, into one metric.

Why software engineers use measure?

Answer: A good software engineer would adopt mechanisms to measure the quality of the analysis and design models, the source code, and the test cases. At the project level, the primary focus is to measure errors and defects and derive relevant metrics such as requirement or design errors per function point, errors uncovered per review hour, errors per thousand lines of code.

What are metrics for small organization?

Organizations without metrics can find it difficult to evaluate their processes and compare old results against anticipated outcomes; these organizations will not be able to spot the good or bad trends and determine software process model improvement. It is vital that organizations embrace SPMM in order to avoid repeating the same (potentially very costly) mistakes and then use these results to self-evaluate and move the organization more efficiently towards a model of success. Small organizations see the adoption of SPMM as a luxury that requires many employees in order to effectively achieve the desired results and may be more inclined to hire a single professional experience in SPMM rather than train the employees from the ground up due to cost associated with training the employees and with production cycle time loss resultant in training.

Why we need metric?

Answer: Metrics give you a better insight into the state of the process or product. These insights are not the problems but just the indicators of problems. A software engineers collects measures and develops metrics and indicators.

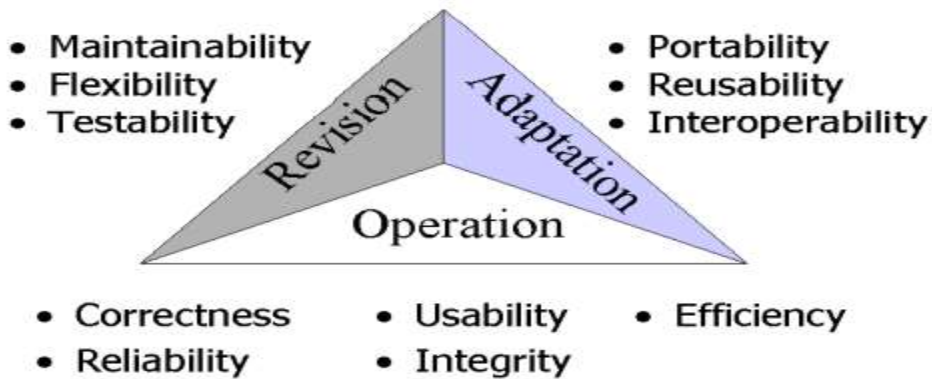
Give any three quality factor of adaption?

Ans: portability, reusability, interOperability.

Give any three quality factor of Revision?

Answer: Maintainability, usability or flexibility

In the mccall model What are the quality related operation?



If spoilage is decreases then what effect of maintainability?

Answer: A cost oriented metric used to assess maintainability is called Spoilage. It is defined as the cost to correct defects encountered after the software has been released to the users. Spoilage cost is plotted against the overall project cost as a function of time to determine whether the overall maintainability of software produced by the organization is improving.

Do you think flexibility and maintainability is small thing?

Answer: No, these are not the same things because System flexibility describes the ease of expanding the product with new feature sets and capabilities. System maintainability, on the other hand, describes the ease of coding bug repairs and adding minor features. Both are determined by the architecture and techniques used to create the code and resulting quality of the code.

How design of a software is measured quantitatively?

Answer: The quality of the architectural design can be measured by measuring its complexity as shown below:

– Structural complexity $S = (f_{out})^2$

– Data complexity $D = v/(f_{out} + 1)$ • 'v' is the number of input and output variables

– System complexity $C = \sum (S_i + D_i)$

Question: $N_f = 25$, $N_{nf} = 5$ and $N_{ui} = 10$ Calculate the lack of ambiguity in the given requirement Define "baseline data"?

Answer: In order to use the data for estimation and drawing conclusions, it must be base-lined. In the baseline, data from past projects is collected, cleaned, and put in a database. Such metrics baseline is used to reap benefits at the process, project, and product level.

Question: List at least one advantage of using statistical control techniques in software engineering?

Ans: Any one you can pick

- 1) It provides a means of detecting error at inspection.
- 2) It leads to more uniform quality of production.
- 3) It improves the relationship with the customer.
- 4) It reduces inspection costs.
- 5) It reduces the number of rejects and saves the cost of material.
- 6) It provides a basis for attainable specifications.
- 7) It points out the bottlenecks and trouble spots.

Question: How can we develop Moving Ranges Control Charts?

We can develop the Moving Range Control Chart as follows:

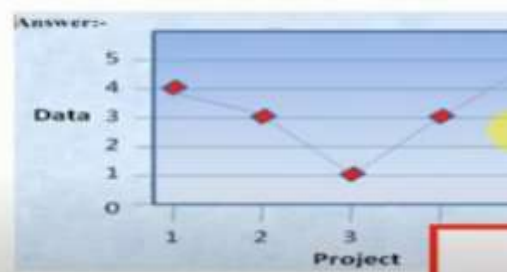
1. Calculate the moving ranges: the absolute values of the successive differences between each pair of data point. Plot these moving ranges on your chart. (the dark blue line)
2. Calculate the mean of the moving ranges. Plot this on the chart. (the red line)
3. Multiply the mean with 3.268. Plot this as the Upper Control Line (UCL). This line is 3 standard deviations above the line. (the light blue line)
4. To determine whether the process metrics description is stable, a simple question is asked: are the moving ranges values inside the UCL? If the answer is yes, then the process is stable otherwise it is unstable.

Consider the following graph?

Answer: Product is in unstable condition as gap between the defects reported and defects fixed is increasing.

Question: Given the data, draw a moving range control chart in order to explain whether the process is stable or unstable?

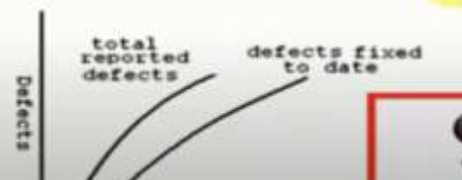
project:	1	2	3	4	5
Data:	4	3	1	3	5



Question: uses of control chart.

Use of control Chart?

Answer: We have to determine whether the trend is statistically valid or not. We also need to determine what changes are meaningful. A graphical technique known as control charts is used to determine this. Control charts are of two types: moving range control chart and individual control chart.



Question: What would you understand by the term Risk?

It is linked with foresight, and that's what futurists try to do. a person or thing considered with respect to the characteristics that may cause an insured event to occur or IT is exposure to a proposition of which one is uncertain. Risk concerns future happenings. Today and yesterday are beyond active concern. The question is, can we, therefore, by changing our action today create and opportunity for a different

and hopefully better situation for ourselves tomorrow. This means, second, that risk involves change, such as changes in mind, opinion, action, or places

Question: Precisely describe the following?

There are two basic risk management philosophies, reactive and proactive.

• **Reactive** – Indiana Jones school of risk management

- Never worrying about problems until they happened, and then reacting in some heroic way – Indiana Jones style.

• **Proactive**

- Begins long before technical work starts
- Risks are identified, their probability and impact are analyzed, and they are ranked by importance.
- Risk management plan is prepared
 - Primary objective is to avoid risk
 - Since all risks cannot be avoided, a contingency plan is prepared that will enable it to respond in a controlled and effective manner

Types of risk?

Each project is faced with many types of risks. These include:

- **Project risks**
 - Will impact schedule and cost
 - Includes budgetary, schedule, personnel, resource, customer, requirement problems
- **Technical risks**
 - Impact the quality, timelines, and cost
 - Implementation may become difficult or impossible
 - Includes design, implementation, interface, verification and maintenance problems
 - Leading edge technology
- **Business risks**
 - Marketability
 - Alignment with the overall business strategy
 - How to sell
 - Losing budget or personnel commitments

Differentiate b/w generic risks and product specific risks?

Generic risks are threats to every project whereas **Product specific risks** are specific to a particular project.

Assessing Overall Project Risks what queries avoid to be addressed?

- Have top software and customer managers formally committed to support the project?
- Are end-users committed to the project and the system/product to be built?
- Are requirements fully understood?
- Have customers been involved fully in requirement definition?
- Do end-users have realistic expectations?
- Does the software team have right mix of skills?

What is ment by Risk Projection?

Risk projection is concerned with risk estimation. It attempts to rate risks in two ways: likelihood and consequences. There are four **risk** project activities. These are:

- Establish a scale that reflects the perceived likelihood of risk
- Delineate the consequences
- Estimate impact
- Note the overall accuracy of **risk** projection

1 benefit of risk exposure?

Assessment of risk impact is a non-trivial process. Factors affecting the consequences are the nature, scope, and timing. For each risk an exposure is calculated as follows:

RE = Probability of the risk x Cost

This risk exposure is then used to identify the top risks and mitigation strategies.

What is Effort validation?

Every project has a defined number of staff members. As time allocation occurs, the project manager must ensure that no more than the allocated number of people has been scheduled at any given time.

Differentiate b/w casual and structured?

Casual

All process framework activities are applied, but **only a minimum task** set is required. It requires **reduced umbrella** tasks and **reduced documentation**. Basic principles of **SE** are however still followed.

Structured

In this case a **complete process framework is applied**. Appropriate framework **activities, related tasks, and umbrella activities** (to ensure high quality) are also **applied**. **SQA, SCM, documentation, and measurement are conducted in streamlined manner.**

Remember me in yours precious prayers!