88701 SQA 68317

(2½ Hours)

[Total Marks: 75]

N. B.: Only the points are mentioned, Examiner has to give the marks according to the explanation given by the students.

1. Attempt *any three* of the following: **15**

a. Define the term quality and elaborate different views on quality.

Quality is fitness for use. It is conformance to specification…Definition 2 marks
Different views 3 marks

1. Customer-Based Definition of Quality Quality product must have '**Fitness for use**' and must meet customer needs, expectations and help in achieving customer satisfaction and possibly customer delight. Any product can be considered as a quality product if it satisfies its purpose of existence through customer satisfaction. This definition is mainly derived by an approach to quality management through '**Quality is fitness for use**'.

2. Manufacturing-Based Definition of Quality This definition is mainly derived from engineering product manufacturing where it is not expected that the customer knows all requirements of the product, and many product level requirements are defined by architects and designers on the basis of customer feedback/survey. Market research may have to generate requirement statement on the basis of perception of probable customers about what features and characteristics of a product are expected by the market. A quality product must have a definition of requirement specifications, design specifications, etc. and the product must conform to these specifications. The development methodologies used for the purpose must be capable of producing the right product in first go and must result into a product having no/minimum defects. This approach gives the definition of '**Conformance to requirements**'.

3. Product-Based Definition of Quality The product must have something that other similar products do not have which can help the customer satisfy his/her needs in a better way. These attributes must add value for the customer/user so that he/she can appreciate the product in comparison to competing products. This makes the product distinguishable from similar products in the market. Also, the customers must feel proud of owning it due to its inherent attributes and characteristics.

4. Value- Based Definition of Quality A product is the best combination of price and features or attributes expected by or required by the customers. The customer must get value for his investment by buying the product. The cost of a product has direct relationship with the value that the customer finds in it. More value for the customer helps in better appreciation of a product. Many times it is claimed that '**People do not buy products, they buy benefits**'.

5. Transcendent Quality To many users/customers, it is not clear what is meant by a 'quality product', but as per their perception it is something good and they may want to purchase it because of some quality present/absent in the product. The customer will derive the value and may feel the pride of ownership.

QUALITY VIEW

• **Employee** People working in a project/an organisation may be termed as employees. These people may be permanent/temporary workers but may not be contractual labours having no stake in product success. (Contractual workers may come under supplier category.) As the projects/organisations become successful, people working on these projects/in these organisations get more recognition, satisfaction, pride, etc. They feel proud to be part of a successful mission.

• **Management** People managing the organisation/project may be termed as management in general. Management may be divided further into project management, staff management, senior management, investors, etc. Management needs more profit, recognition, turnover improvements, etc to make their vision and mission successful. Successful projects give management many benefits like expanding customer base, getting recognition, more profit, more business, etc.

There are two more stakeholders in the success as well as failure of any project/product/organisation. Many times, we do not feel their existence at project level or even at organisation level. But they do exist at macro level.

• **Society** Society benefits as well as suffers due to successful projects/organisations. It is more of a perception of an individual looking towards the success of the organisation. Successful organisations/ projects generate more employment, and wealth for the people who are in the category of customer, supplier, employee, management, etc. It also affects the resource availability at local as well as global level like water, roads, power supply, etc. It also affects economics of a society to a larger extent. Major price rise has been seen in industry dominated areas as the paying capacity of people in these areas is higher than other areas where there is no such industry.

• **Government** Government may be further categorised as local government, state government, central government, etc. Government benefits as well as suffers due to successful projects/organisations. Government may get higher taxes, export benefits, foreign currency, etc. from successful projects/organisations. People living in those areas may get employment and overall wealth of the nation improves. At the same time, there may be pressure on resources like water, power, etc. There may be some problems in terms of money availability and flow as success leads to more buying power and inflation.

• **Customer** Customer is the main stakeholder for any product/project. The customer will be paying for the product to satisfy his requirements. He/she must benefit by acquiring a new product. Sometimes, the customer and user can be different entities but here, we are defining both as same entity considering customer as a user. Though sometimes late delivery penalty clauses are included in contract, the customer is interested in the product delivery with all features on defined scheduled time and may not be interested in getting compensated for the failures or delayed deliveries.

• **Supplier** Suppliers give inputs for making a project/product. As an organisation becomes successful, more and more projects are executed, and suppliers can make more business, profit and expansion. Suppliers can be external or internal to the organisation. External suppliers may include people supplying machines, hardware, software, etc. for money while internal suppliers may include other functions such as system administrator, training provider, etc. which are supporting projects/product development.

b. Explain the lifecycle of quality improvements

The four steps of quality improvement are identified below.

They include the steps of **identify**, **analyze**, **develop**, and **test/implement**.

c. What are the quality principles of Total Quality Management (TQM)?

1 DEVELOP CONSTANCY OF PURPOSE OF DEFINITION AND DEPLOYMENT OF VARIOUS INITIATIVES

2 ADAPTING TO NEW PHILOSOPHY OF MANAGING PEOPLE/ STAKEHOLDERS BY BUILDING CONFIDENCE AND RELATIONSHIPS

3 DECLARE FREEDOM FROM MASS INSPECTION OF INCOMING/ PRODUCED OUTPUT

4 STOP AWARDING OF LOWEST PRICE TAG CONTRACTS TO SUPPLIERS

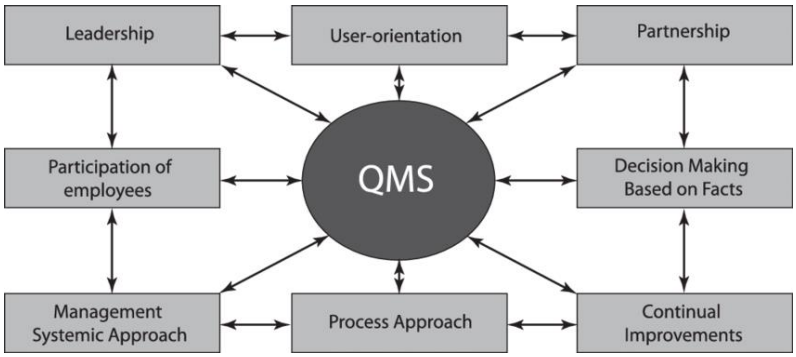
5 IMPROVE EVERY PROCESS USED FOR DEVELOPMENT AND TESTING OF PRODUCT

6 INSTITUTIONALISE TRAINING ACROSS THE ORGANISATION FOR ALL PEOPLE

7 INSTITUTIONALISE LEADERSHIP THROUGHOUT ORGANISATION AT EACH LEVEL

8 DRIVE OUT FEAR OF FAILURE FROM EMPLOYEES

d. Explain the structure of quality management system.



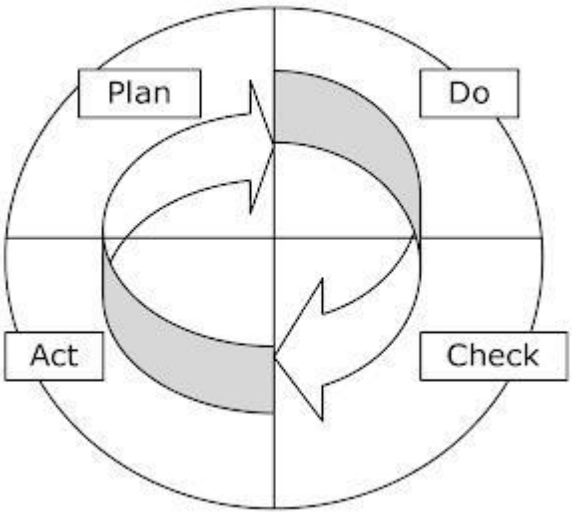
Explanation with points is expected.

e. How the quality and productivity are related with each other?
The points are as follows;

- Improvement in Quality Directly Leads to Improved Productivity
- Effective Way to Improve Productivity is to Reduce Scrap and Rework
- Quality Improvements Lead to Cost Reduction
- Proper Communication Between Management and Employee is Essential
- Employees Participate and Contribute in Improvement Process
- Employee Shares Responsibility for Innovation and Quality Improvement

f. Write a short note on continual improvement cycle.

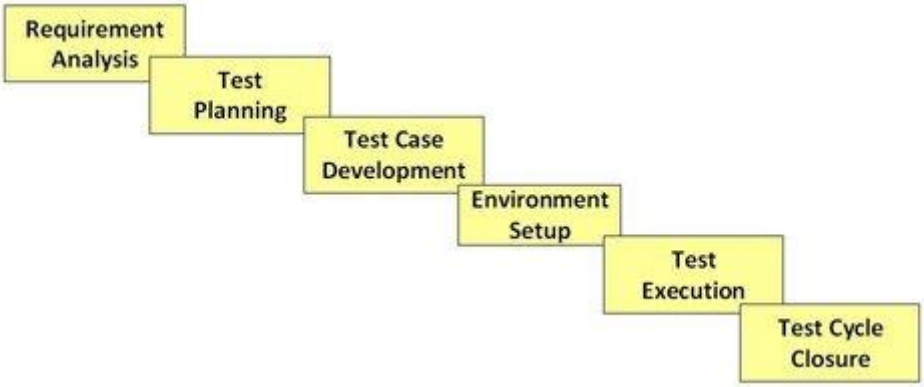
Plan, Do, Check, and Act (PDCA) Cycle Continual (Continuous) improvement cycle is based on systematic sequence of Plan–Do–Check–Act activities representing a never ending cycle of improvements.



2. Attempt *any three* of the following: **15**

a. Explain the lifecycle of software testing.

Software Testing Life Cycle (STLC) is defined as a sequence of activities conducted to perform Software Testing. Software Testing is not a just a single activity. It consists of a series of activities carried out methodologically to help certify your software product.



b. Write a note on requirement traceability matrix.

Requirement **Traceability** Matrix or RTM **captures** all requirements proposed by the client or software development team and their traceability in a **single** document **delivered** at the conclusion of the life-cycle.

It contains:

- Requirement ID
- Requirement Type and Description
- Test Cases with Status

c. State and explain any 5 principles of software testing.

1. Testing shows presence of defects
2. Exhaustive testing is impossible
3. Early testing
4. Defect clustering
5. Pesticide paradox
6. Testing is context dependent
7. Absence of error – fallacy

d. Explain the relationship between error, defect and failure with a proper example.
The variation between the actual results and expected results is known as **defect**.
If a developer unable to successfully compile or run a program then they call it as an **error**.
Once the product is deployed and customers find any issues then they call the product as a **failure** product or after a release, if an end user finds an issue then that particular issue is called as **failure.**

e. Discuss the challenges in software testing.

1) Complete testing is impossible

2) Setting the right process

3) Lack of proper communication

4) Lack of resources

5) Test coverage

f. Describe the structure of a testing team.

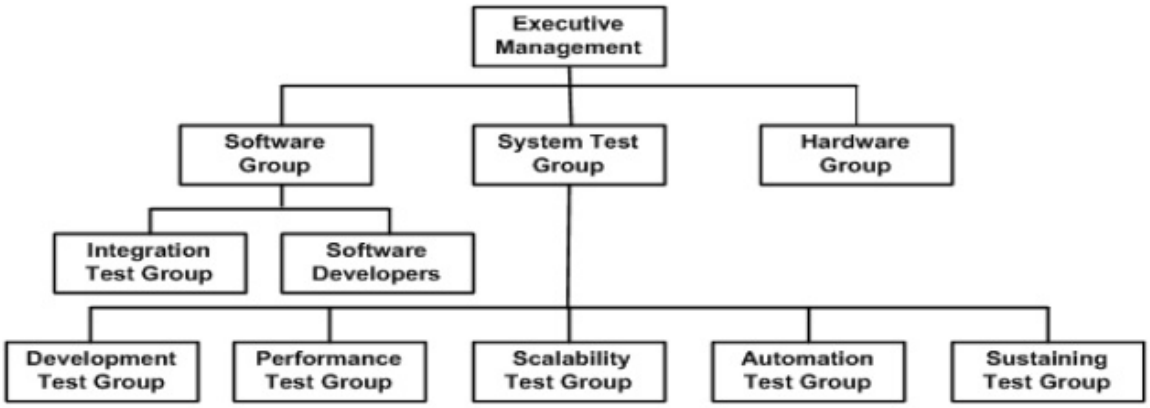


Diagram and Explanation with roles of test team.

3. **Attempt *<u>any three</u>* of the following:** **15**

a. Explain boundary value testing and its guidelines.

In software testing, the ***Boundary Value Testing*** is a black box test design technique based on test cases. This technique is applied to see if there are any bugs at the boundary of the input domain. Thus, with this method, there is no need of looking for these errors at the center of this input.

BVA helps in testing the value of boundary between both valid and invalid boundary partitions. With this technique, the boundary values are tested by the creation of test cases for a particular input field.

b. Write a note on improved equivalence class testing.

Improved Equivalence Class Testing

The key of equivalence class testing is the choice of the equivalence relation that determines the classes. Very often, we make this choice by second-guessing the likely implementation and thinking about the functional manipulations that must somehow be present in the implementation.

c. Describe the decision table testing technique in detail.

Decision tables have been used to represent and analyze complex logical relationships since the early 1960s. They are ideal for describing situations in which a number of combinations of actions are taken under varying sets of conditions.

A decision table has four portions: the part to the left of the bold vertical line is the **stub portion**; to the right is the **entry portion**. The part above the bold horizontal line is the **condition portion**, and below is the **action portion**. Thus, we can refer to the condition stub, the condition entries, the action stub, and the action entries. A column in the entry portion is a rule. Rules indicate which actions, if any, are taken for the circumstances indicated in the condition portion of the rule.

Portions of a Decision Table

Stub	*Rule 1*	*Rule 2*	*Rules 3, 4*	*Rule 5*	*Rule 6*	*Rules 7, 8*
c1	T	T	T	F	F	F
c2	T	T	F	T	T	F
c3	T	F	—	T	F	—
a1	X	X		X		
a2	X				X	
a3		X		X		
a4			X			X

d. Write a note on DD path testing.

The best-known form of code-based testing is based on a construct known as a decision-to - decision

path (DD-path) (Miller, 1977). The name refers to a sequence of statements that, in Miller's words, begins with the "outway" of a decision statement and ends with the "inway" of the next decision statement. No internal branches occur in such a sequence, so the corresponding code is like a row of dominoes lined up so that when the first falls, all the rest in the sequence fall.
We will define DD-paths in terms of paths of nodes in a program graph. In graph theory, these paths are called chains, where a chain is a path in which the initial and terminal nodes are distinct, and every interior node has indegree = 1 and outdegree = 1.

Definition

A *DD-path* is a sequence of nodes in a program graph such that
Case 1: It consists of a single node with indeg = 0.
Case 2: It consists of a single node with outdeg = 0.
Case 3: It consists of a single node with indeg ≥ 2 or outdeg ≥ 2.
Case 4: It consists of a single node with indeg = 1 and outdeg = 1.
Case 5: It is a maximal chain of length ≥ 1.

e. Explain the concept and significance of cause and effect graphing technique.

Cause-Effect Graph graphically shows the connection between a given outcome and all issues that manipulate the outcome. Cause Effect Graph is a black box testing technique. It is also known as Ishikawa diagram because of the way it looks, invented by Kaoru Ishikawa or fish bone diagram.
Significance:

- It Helps us to determine the root causes of a problem or quality using a structured approach.
- It Uses an orderly, easy-to-read format to diagram cause-and-effect relationships.
- It Indicates possible causes of variation in a process.
- It Identifies areas, where data should be collected for further study.
- It Encourages team participation and utilizes the team knowledge of the process.
- It Increases knowledge of the process by helping everyone to learn more about the factors at work and how they relate

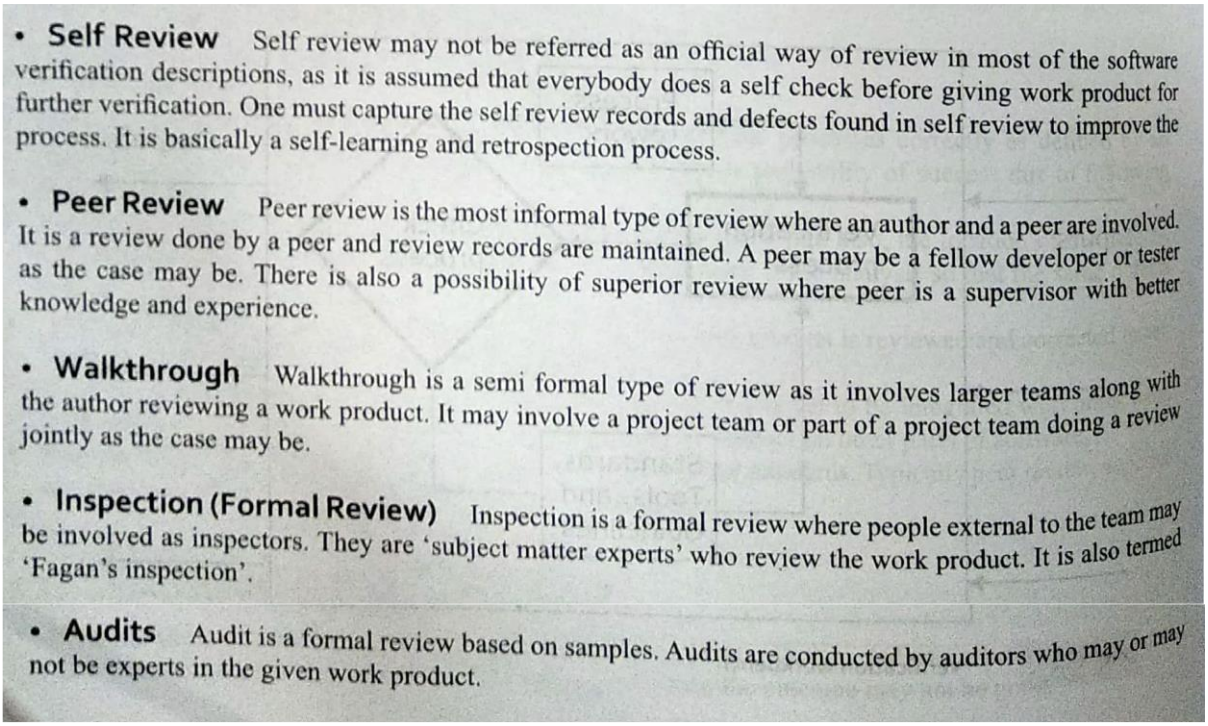
f. Compare weak robust and strong robust equivalence class testing.

Strong Robust Equivalence Class Testing

At least the name for this form is neither counterintuitive nor oxymoronic, just redundant. As before, the robust part comes from consideration of invalid values, and the strong part refers to the multiple fault assumption. We obtain test cases from each element of the Cartesian product of all the equivalence classes, both valid and invalid, as shown in Figure
Weak Robust Equivalence Class Testing: Like weak normal equivalence, weak robust testing too tests one variable from each equivalence class. However, unlike the former method, it is also focused on testing test cases for invalid values.

4. Attempt *any three* of the following: **15**

a Explain different methods of verification.



• **Self Review** Self review may not be referred as an official way of review in most of the software verification descriptions, as it is assumed that everybody does a self check before giving work product for further verification. One must capture the self review records and defects found in self review to improve the process. It is basically a self-learning and retrospection process.

• **Peer Review** Peer review is the most informal type of review where an author and a peer are involved. It is a review done by a peer and review records are maintained. A peer may be a fellow developer or tester as the case may be. There is also a possibility of superior review where peer is a supervisor with better knowledge and experience.

• **Walkthrough** Walkthrough is a semi formal type of review as it involves larger teams along with the author reviewing a work product. It may involve a project team or part of a project team doing a review jointly as the case may be.

• **Inspection (Formal Review)** Inspection is a formal review where people external to the team may be involved as inspectors. They are 'subject matter experts' who review the work product. It is also termed 'Fagan's inspection'.

• **Audits** Audit is a formal review based on samples. Audits are conducted by auditors who may or may not be experts in the given work product.

b Explain the steps involved in management of verification and validation.

1. Defining the processes for verification and validation
2. Prepare plans for execution of process
3. Initiate implementation plan
4. Monitor execution plan
5. Analyze problems discovered during execution
6. Report progress of the processes.

c Describe the benefits of review technique.

A review is a systematic examination of a document by one or more people with the main aim of finding and removing errors early in the software development life cycle**. Reviews** are used to verify documents such as requirements**,** system designs, **code**, test plans and test cases.

Benefits of Review:

Early defect detection and correction – It is much cheaper to remove errors when found during review than finding errors by running tests on execution code.

Development productivity improvements and reduced development timescales

Reduced testing cost and time

Lifetime cost reduction

Fewer defects and improved communication

Can find Omissions

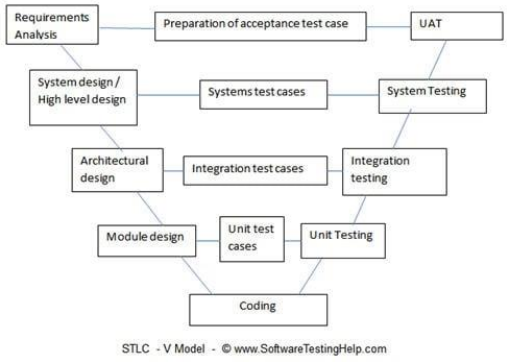
d List and explain how the formal review is carried out.

Formal review is carried out in following stages:

1. Planning
2. Kick-off
3. Preparation
4. Review meeting
5. Rework
6. Follow-up

e Explain the VV model of testing.

It is also known as **Verification and Validation model**.



UAT: User Acceptance Testing

f What are the roles and responsibilities of a reviewer

1. **Moderator**: The Moderator is the key role in a code review. The moderator is responsible for selecting a team of reviewers, scheduling the code review meeting, conducting the meeting, and working with the author to ensure that necessary corrections are made to the reviewed document.
2. **Author**: The Author wrote the code that is being reviewed. The author is responsible for starting the code review process by finding a Moderator. The role of Author must be separated from that of Moderator, Reader, or Recorder to ensure the objectivity and effectiveness of the code review. However, the Author serves an essential role in answering questions and making clarifications during the review and making corrections after the review.
3. **Reader**: The Reader presents the code during the meeting by paraphrasing it in his own words. It is important to separate the role of Reader from Author, because it is too easy for an author to explain what he meant the code to do instead of explaining what it actually does. The reader's interpretation of the code can reveal ambiguities, hidden assumptions, poor documentation and style, and other errors that the Author would not be likely to catch on his own.
4. **Scribe**: The Scribe records all issues raised during the code review. Separating the role of Scribe from the other roles allows the other reviewers to focus their entire attention on the code.

5. Attempt *any three* of the following: **15**

a. What is integration testing? Explain the Big bang approach

Integration testing is the phase in software testing in which individual software modules are combined and tested as a group. Integration testing is conducted to evaluate the compliance of a system or component with specified functional requirements. It occurs after unit testing

In **Big Bang** integration testing all components or modules are integrated simultaneously, after which everything is tested as a whole. In this approach individual modules are not integrated until and unless all the modules are ready. In Big Bang integration testing all the modules are integrated without performing any integration testing and then it's executed to know whether all the integrated modules are working fine or not.

b. What is the need of a Security Testing?

Security Testing is defined as a type of Software Testing that ensures software systems and applications are free from any vulnerabilities, threats, risks that may cause a big loss. Security testing of any system is about finding all possible loopholes and weaknesses of the system which might result into a loss of information, revenue, repute at the hands of the employees or outsiders of the Organization

The need is to do

- Vulnerability Scanning
- Penetration testing
- Risk Assessment
- Ethical hacking

c. What is performance testing? List different types of performance testing.

Performance testing is the process of determining the speed, responsiveness and stability of a computer, network, software program or device under a workload. **Performance testing** can involve quantitative **tests done** in a lab, or occur in the production environment in limited scenarios

Types are:

1. Load testing....

2. Stress testing. ...

3. Endurance testing. ...

4. Spike testing. ...

5. Volume testing.

d. Explain the concept of inter system testing and its Importance.

Many a times, an application is hosted across locations; however, all data needs to be deployed over a central location. The process of testing the integration points for single application hosted at different locations and then ensuring correct data flow across each location is known as inter system testing.

It helps to ensure interconnection between application functions correctly.

e. Explain the significance of Usability testing.

Usability Testing is defined as a type of **software testing** where, a small set of target end-users, of a **software** system, "use" it to expose **usability** defects. This **testing** mainly focuses on the user's ease to use the application, flexibility in handling controls and the ability of the system to meet its objectives

The goal / Significance of usability testing is to identify **any** usability problems, collect quantitative data on participants' performance (e.g.**,** time on task, error rates), as well as determine user satisfaction with the website

f. Explain Commercial off-the-shelf software testing.

'COTS' stands for 'Commercially Of The Shelf' software. These softwares are readily available in the market and user can buy and use them directly. These may be integrated in a new development, or used for development or testing activities as a tool, as the case may be.

- 'COTS' are developed with general requirements collected from the market. It may not exactly match with organisation's needs and expectations. One must find the percentage fit of 'COTS' to the organisation business and then decide whether it is successful or not.
- Some 'COTS' may need changing business processes to suite the 'COTS' implementation in organisation. This is another way of Business Process Reengineering (BPR) for an organisation where internationally proven practices can be implemented by using 'COTS'. 'COTS' may have some of their best processes accepted at national/international level, and organisation may get benefited by using such processes along with the product.
- Sometimes, 'COTS' may need configuration of software or system to suite business needs. Generally, when 'COTS' are implemented, many business rules must be defined to customise the software to the organisation.