

CHAPTER 1- INFORMATION SYSTEMS CONCEPTS

1. Define System

Ans. It is an orderly arrangement of a set of interrelated & interdependent elements that operate collectively to accomplish some common purpose or goal.

Example- Human body is a system consisting of several parts such as head, heart, hands, legs and so on. These parts are related by means of connecting networks of blood vessels & nerves and the system has a main goal of "Living".

2. Explain the various types of a System.

V.Imp.

According to Elements (i) Abstract System: It is an orderly arrangement of interdependent ideas. (ii) Physical System: It is a set of Tangible elements which operate together to accomplish an objective. Eg. School System which consists of buildings, teachers, administrators & text books that function together to provide education to students	According to Interactive Behavior (i) Open System: It interacts freely with its environment by taking input & returning output. With change in environment, an open system also changes to match itself with the environment. (ii) Closed System: It neither interacts with the environment nor changes with the change in environment
According to Degree of Human Intervention (i) Manual System: In these systems, data collection, manipulation, maintenance & final reporting are carried out absolutely by human efforts. (ii) Automated Systems: In these systems, above mentioned tasks are carried out by using micro-processors. However, to some extent, system also depends on manual intervention.	According to Working/Output (i) Deterministic System: It operates in a predictable manner wherein the interaction among the parts is known with certainty. Example: If one has a description of the state of the system at a given point of time plus a description its operation, the next state of the system may be given exactly, without error. (ii) Probabilistic system: In such systems, output can be predicted with certain degree of error. Example: A set of instructions given to a human who may not follow them exactly.

3. What do you mean by System Entropy? How would you prevent it?

Ans. It refers to the process of system decaying or becoming disordered or disorganised.

Maintenance- Preventing or offsetting an increase in entropy requires inputs of matter and energy to repair, replenish & maintain the system. This maintenance input is called **Negative Entropy**.

Open systems require more negative entropy for keeping a steady state of operations.

4. Explain briefly the General Model of a System.

Ans. Input i.e the data flowing into the system from outside.

Processing is the action of manipulating the input into a more useful form.

Output is the information flowing out of a system.

Storage is the means of holding info. for use at a later date.

Feedback occurs when the outcome has an influence on the input.

5. Define System Environment.

Components outside the system boundary are known as System environment. It is a collection of elements in which the system operates. These elements surround the system and interact with it.

6. Define System Boundary.

It is the limitation of system within which the system components work together. A system exists inside the boundary whereas the environment exists outside the boundary.

7. Distinguish between Sub-System & Supra-System.

Point of difference	Sub-System	Supra-System
Meaning	It is a set of inter-related components which constitute a part of a larger entity	The system immediate above a sub-system is known as Supra-system.
Process	These are analysed by the process of Decomposition	These are derived by the process of Integration of different sub-systems.
Example	Input, Control Unit, ALU etc are sub-systems of a computer system.	Sales order processing, customer service, promotion & publicity etc are the components of Marketing Supra-system.

8. Explain the Characteristics of Sub-systems.

Ans. (i) Decomposition: Since it is difficult to manage a complex system when considered as a whole. Therefore, for the sake of convenience & clarity, a system is divided into small systems. The process of dividing a system into small systems is called decomposition. The process of decomposition is continued until smallest sub-systems are of manageable size.

(ii) Simplification: The process of decomposition may lead to large no. of inter-connections, which may not be manageable. Thus, in order to reduce these large no. of inter-connections, a process of organising sub-systems is applied which is called Simplification.

(iii) Decoupling: If two sub-systems are connected tightly with each other then very close co-ordination is required between them for their operation.

Example: If the R/M is put directly into the production at the moment R/M arrives in the factory then R/M system is tightly coupled with the Production system.

9. Define System Stress & System Change.

System stress - A stress is a force transmitted by a system's supra-system that causes the system to change, so that the supra-system can achieve its own goals better. In trying to accommodate the stress, the system may impose stress on its sub-systems and so on.

System change - A system change because it undergoes stress. Sub-systems which do not adapt themselves to stress, tend to decay & terminate.

10. What is meant by Information?

Ans. The term "Data" and "Information" are often used interchangeably. However, the relation of Data to Information is that of R/M to F/P. A data processing system processes data to generate info. on which business decisions are based. Thus, the quality of info. determines the quality of action/decision. Therefore, Info. plays a vital role in the survival of a business.

11. Explain the Attributes/Characteristics of Info.

- | | | | |
|------------------|-------------------|--------------------|----------------|
| (i) Availability | (iv) Reliability | (vii) Purpose | (x) Rate |
| (ii) Validity | (v) Adequacy | (viii) Value | (xi) Frequency |
| (iii) Quality | (vi) Transparency | (ix) Mode & Format | (xii) Decay |

12. Distinguish b/w Internal & External Info.

Point of Difference	Internal Information	External Information
Source	This info is generated from the operations of the organisation at various functional areas.	It is collected from the external environment of the organisation.
Flow of Info.	The internal info gets processed & summarized from junior to top most level of mgt.	Data on such info is directly obtained by top level from external sources.
Purpose	Planning info related to external environment	Controlling info related to Internal environment.
Significance	It always pertains to the various operational units of the organisation.	It is considered to observe the effect of external info on the organizational performance.
Example	Production & Sales Report, Financial Statements	Govt Policies, New Laws & Regulations

13. Explain the Significance/Advantages of Info/Info system in Mgt process/Business Process. RTP May 2010; May 2010 Explain some of the important implications of Info system in business. RTP May 2013

- Ans. (i) Info system helps take right decision at the right time.
(ii) Info systems help managers in effective decision-making.
(iii) Innovative ideas for solving critical problems may come out from good info system.
(iv) Knowledge gathered through info system may be utilised by managers in unusual situations.
(v) Based on well-designed info system, an organization may gain edge in the competitive environment.

14. Explain the factors on which info requirements of Managers/Executives depend.

Ans. The factors on which info requirements of managers/executives depend are as follows:

1. Operational Function (i) The grouping or clustering of several functional units on the basis of related activities into sub-systems is termed as Operational Function.

For Example Marketing is an Operational Function, as it is the clustering of several functional units like market research, advertising, sales analysis and so on.

(ii) The info requirement of different operational functions varies in content and in characteristics where the content of info depends upon the activities performed under an operational function.

For Example In case of Marketing Functions, the content of info may be about the consumer behavior, new product's impact in the market etc.

2. Type of Decision-Making:

Programmed /Structured Decisions

- (i) Programmed decisions are made w.r.t familiar, routine & recurring problems where not much judgment & discretion is required but it is just a matter of identifying the problem & applying the rule.
(ii) These decisions are made on problems & situations by reference to a pre-determined set of precedents, procedures, techniques and rules.
(iii) As a problem/issue for decision-making emerges, the relevant pre-decided rule or procedure is applied, thus, simplifying the process of decision-making.

Non-Programmed/Unstructured Decisions

- (i) These decisions are made on situations which are unusual & non-repetitive about which not much knowledge & info are available.
(ii) These decisions are not made by reference to any pre-determined guidelines, standard operating procedures, precedents & rules. But are made by application of managerial intelligence, Experience, Judgment & Vision to tackling the problems & situations.
For Example: Problems such as sudden major change in Govt. Policies adversely affecting an industry.

3. Level of Management Activity:

(i) Strategic level or Top level: a) Decisions made at this level are based to handle critical problems for the survival & success of the organisation.
b) They have a vital impact on the direction & functioning of the organisation.

For Example-Decisions on plant location, introduction of new products etc.

- (ii) Tactical level Or Middle level:** a) This level lies in the middle of managerial hierarchy where managers plan,organise,lead & control the activities of other managers.
b) Decisions made at this level are known as tactical decisions or operational decisions.
c) These decisions are relatively short,specific & functional.

(iii) Operational level or Supervisory level: a) This level is the lowest level of managerial hierarchy wherein the managers co-ordinate the work of others who are not themselves managers.

- b) They ensure that specific tasks are carried out effectively & efficiently.

15. Explain the Components of Computer Based Info System (CBIS).

Ans. CBIS is an info system where computer plays a major role.Such a system consists of following elements:

(i) Hardware: It refers to machinery including the computer itself which is often referred to as CPU & all of its support equipments like I/O devices,Storage devices & Communication devices.

(ii) Software: It refers to computer programs & the manuals that support them.Computer programs are machine readable instructions that direct the CBIS to produce useful info from the data.

(iii) Data: Data are the facts that are used by programs to produce useful info.

(iv) Procedures: These are the policies that govern the operation of a computer system.Procedures specify the actions that people should take in a step-by-step manner.

(v) People: People are probably the components of a CBIS that influence the success or failure of info systems.Users,Programmers,system Analysts & DBA are just some of the people associated with the CBIS.

16. Explain the Characteristics of CBIS.

May 2011; RTP May 2013

Ans. (i) All systems work for some pre-determined objectives and the system is designed & developed accordingly.

(ii) A system has no. of sub-systems,if one sub-system fails,the whole system does not work.

(iii) No sub-system can work in isolation;it depends on other sub-systems for its inputs.

(iv) Diff. Sub-systems interact each other to achieve the goal of the system.

(v) The goal of individual sub-systems is of lower priority than the goal of the entire system.So,the work done by individual sub-systems is integrated to achieve the central goal of the system.

17. What are the major Areas of CBIS?

Area	Application/Use
Finance & Accounting	Typical sub-application areas under this sub-system are- Financial accounting,General Ledger,Accounts Receivable/Payable,Cash mgt,Treasury mgt,Investment mgt,Fund mgt & B/S.
Marketing & Sales	The Sales Deptt. may use an order processing system to keep status & track of orders,generate bills for the orders executed & delivered to the customer,strategies for rendering services during warranty period & beyond,analyzing the sales data by category such as- by Region,product,salesman or sales value.
Production or manufacturing	The system generates production schedules & schedules of material requirements,monitor the product quality,plans for replacement or overhauling the machinery and also helps in O/H cost control & waste control.
Inventory/Stores Mgt	The system is used to regulate the minimum & maximum level of stocks,raise alarms at danger level stock,identifying the imp. items in stock (ABC Analysis),identifying most frequently moving items (XYZ Analysis) etc.
Human Resource Mgt	HRM system achieves the goals like less disputes,right utilization of manpower & quiet environment in functional area.An HRM system may have Modules like - Personnel Administration,Recruitment Mgt,Travel Mgt,Benefit administration,Salary administration,promotion mgt.

18. Explain the Types of Info Systems at Different Levels.

Ans. Mgt at diff. Levels take decisions matching to their position or hierarchy in the organisation.So,diff. Types of info systems are designed & developed accordingly.Organisation can be considered as a pyramidal mgt structure with the corporate level managers at the top & operational managers at the bottom.Typical categories of data are manipulated at diff. Levels.

(i) **At the Lowest Level**,the routine office work like maintaining inward register & public interaction are mostly done. This level is managed by operational level managers. No decision-making process is carried out at this level.

(ii) **At the Middle Level of Mgt**,the decision-making process starts. Inputs from diff. Internal & external info sources are collected & processed for strategic decisions.

(iii) **At the Top Level**, the decisions are taken on the basis of the info passed from the middle level mgt.

Transaction processing system(TPS): Business activities involve transactions & these transactions are organised & manipulated to generate various info products for external use. TPS thus records & manipulates transaction data into usable info.

19. Explain the activities involved in Transaction Processing Systems (TPS).

Ans. (i) **Capturing data** to organise in files or databases

(ii) **Processing of files/databases** using application software.

(iii) **Generating info** in the form of reports.

(iv) **Processing of queries** from various quarters of the organisation.

20. Explain the Components of TPS.

Ans. (i) **Inputs:** Source documents such as invoice, slips etc are the physical evidence of inputs into the TPS. They serve several purposes like capturing data, providing a permanent file for future analysis etc.

(ii) **Processing:** This involves the use of journals & registers to provide a permanent & chronological record of inputs.

(iii) **Storage:** Ledgers & files provide storage of data on both manual & computerized systems.

(iv) **Outputs:** Any document generated in the system is output. Some documents are however both output & input. **For Example-** A customer invoice is an output from the order-entry application system & also an input document to the customer.

21. Explain the Features of TPS.

RTP Nov 2013; Nov 2013

(i) **Handling large volume of Data:** Since transactions processing involves large volume of data & requires greater storage capacity. TPS handles large volume of data for processing & storage in it.

(ii) **Automation of basic operations:** TPS aims at automating the basic operations of an organisation & plays a critical role in the day-to-day functioning. TPS is an imp. source of up-to-date info regarding the operations in the enterprise because any failure in the TPS may disorder the functioning of an enterprise.

(iii) **Benefits are easily measurable:** Most of the benefits of TPS are tangible & easily measurable like TPS reduces the workload of the people associated with the operations & improves their efficiency. Therefore, Cost-Benefit Analysis regarding the desirability of TPS is easy to conduct.

(iv) **Source of Input for other systems:** TPS is the basic source of internal info for other systems like MIS, DSS, EIS etc.

22. Define MIS & also Explain the three Concepts of MIS.

Ans. MIS (i) It is an extension to TPS.

(ii) It uses the results produced by TPS but also uses other info.

(iii) It assists managers in decision-making & problem solving by providing them accurate, relevant & timely info in the form of Reports, Tables, Graphs & Charts.

(iv) MIS at the Top level is much more comprehensive.

Components of MIS

1. **Management:** Mgt comprises the processes or activities that describe what managers do in the operation of the organisation. A manager may be required to perform following activities in an organisation:

(i) Determination of organisational objectives.

(ii) Developing plans to achieve the objectives.

(iii) Exercising the adequate controls over the functions.

(iv) Monitoring the results.

(v) Securing & organizing the human & physical resources.

2. **Information:** It is the data that have been put into a meaningful & useful context. The info is considered to be of significance in a particular situation.

3. **System:** A system is defined as set of related components, activities, processes & human beings interacting together so as to accomplish some common objective.

23. Explain the Characteristics of MIS.

RTP May 2012 & Nov 2012; Nov 2013

(i) **Mgt oriented:** Info provided by MIS should be Mgt oriented. But it should not necessarily be meant only for mgt at top level rather it should also meet the info needs of middle level & lower level mgt.

(ii) **Mgt Directed:** Mgt should direct the system's development efforts & should provide their time for system's designing, its review & should ensure that the implemented system meets the specifications as desired.

(iii) **Common Database:** DB should be so organized that it should allow access to other sub-systems & eliminates the necessity of duplication in data storage, updating, deletion & protection.

(iv) **Common Data flows:** It is possible due to use of common input, processing, output procedures & media. This eliminates duplication in data collections, simplifies operations & produces an efficient info system.

(v) **Computerized:** It helps in handling wide variety of applications by providing their info requirements quickly and provides accuracy & consistency in processing data.

(vi) **Integrated:** In a good MIS, all the functional & operational sub-systems are linked together into one unit which helps in generating more meaningful info.

24. Explain the Mis-Conceptions/Myths about MIS.

RTP Nov 2013

1. **MIS is related only with computers:** This is not true because MIS can be Manual or Computerized. A computer is only a tool which helps in the timely & accurate info processing.

2. **More Data means More Info for managers:** This is a mis-conception. It is not the quantity of data but its relevance which is important to managers in the process of decision-making.

3. **Accuracy in Reporting is of Vital importance:** It is true only at operating levels. However, at the higher decision levels, great accuracy may not be required. **For Example:** For a decision on a new project proposal, top mgt is not interested in knowing the project cost in precise rupee terms. A project cost estimated at a fairly correct figure is sufficient.

25. What are the pre-requisites of an effective MIS?

Nov 2010; RTP May 2013

Ans. 1. Top Mgt Support: The MIS to become effective, should receive full support of top mgt.

2. **Qualified system & mgt staff** i.e. it should be manned by qualified officers who are expert in the field of their work. There are two categories of officers:

(i) **Systems & Computer experts:** They should be capable of understanding mgt concepts to facilitate the understanding of problems faced by the concern and they should be clear about the process of decision-making & info requirements for planning & control functions.

(ii) **Mgt Experts:** They should also understand the concepts & operations of a computer so that they can place themselves in a comfortable position while working with the system technicians in designing etc of the info system.

3. **Database:** It can be defined as a “**Super-File**” which consolidates data records previously stored in many data files. Its main characteristic is that each subsystem utilizes the same data & info kept in the same file to satisfy its info needs. The maintenance of data in DB requires computer hardware, software & experienced computer professionals.

4. **Control & maintenance of MIS:** Control of MIS means the operations of the system as it was designed to operate. Mgt is closely related to control. There are times when the need for improvements to the system will be discovered.

5. **Evaluation of MIS:** It should take into account the following points:

- (i) Examining whether, the enough flexibility exists in the system to cope with any expected or unexpected info requirement in future.
- (ii) Ascertaining the views of users & the designers about the capabilities & deficiencies of the system.
- (iii) Guiding the appropriate authority about the steps to be taken to maintain the effectiveness of MIS.

26. Explain the Constraints/problems/difficulties in operating a MIS.

RTP Nov 2012; May 2012

- (i) Non-Availability of Experts; (ii) Problem of selecting the sub-system of MIS to be installed & operated upon;
- (iii) Due to varied objectives of business concerns, **the approach adopted by experts for designing & implementing MIS is a non-standardized one; and** (iv) Non-Availability of Co-operation from Staff

27. What are the effects of using Computer for MIS?

Ans. (i) Speed of processing & retrieval of data increases.

(ii) Scope of analysis widened

(iii) Complexity of system design & operation increased

(iv) Integrates the working of different sub-systems

(v) Increases the effectiveness of info system

(vi) More comprehensive info

28. What are the Limitations of MIS.

Nov 2012

GIGO Principle: The quality of output depends on the quality of input & processes.

1. **Not a substitute for Effective mgt:** It can not replace managerial judgment in making decisions in different functional areas But it is merely a tool in the hands of executives for decision-making & problem solving.

2. **Less effective due to frequent changes in Top Mgt.**

3. **Less effective where culture of hoarding info prevails.**

4. **MIS may not have requisite flexibility** to quickly update itself with the changing needs of time, especially in fast changing & complex environment.

5. **MIS can not provide a Tailor-made info packages** suitable for every type of decision made by executives.

6. **It ignores non-quantitative factors** like morale & attitude of members of the organization.

7. **Less useful for making non-programmed decisions.**

29. What is a DSS? Explain the Characteristics of DSS.

Nov 2008; RTP May 2012

Meaning of DSS: DSS are specific class of CBIS that supports business & organizational decision-making activities. In DSS, the focus is on helping decision makers to become more effective. DSS provides tools to managers to assist them in solving semi-structured & unstructured problems in their own way. A DSS is not intended to make decisions for managers but rather, to provide managers with a set of capabilities that enable them to generate the info required by them in making decisions.

Characteristics: (i) Semi-structured & Unstructured decisions: DSS is designed to support semi-structured & unstructured decision making. These are the decisions for which info obtained from the computer system is only a portion of total knowledge required to make the decisions.

Example of Unstructured Problem: A manager is selecting an accounting software for his company's use. This problem is unstructured because there is no listing of all the features that are desirable in accounting software for his particular co. furthermore; he will need to use his judgment to determine what features are important.

(ii) Flexibility to adapt changes: DSS designer understands that managers usually do not know in advance what info they need, Also, the info needs keep changing constantly. Thus, DSS provides tools to enable users to meet their own output needs.

(iii) Ease of learning & use: Since DSS are often built & operated by users rather than by computer professionals, the tools that accompany them should be relatively easy to learn & use.

30. Explain the various components of DSS.

Ans. 1. **The User:** The user is usually a manager with an unstructured or semi-structured problem to solve. Users, generally, do not require a computer background to use a DSS for solving problems but they require only a thorough understanding of the problem & factors to be considered in finding a solution. The user can be classified as under:

(i) **Manager:** They have basic computer knowledge & they desire the DSS to be very user-friendly.

(ii) **Staff specialist (Analysts):** They are more details oriented & willing to use complex system in their day to day work.

2. **Databases:** DSS include one or more databases that contain both routine & non-routine data from internal & external sources. DSS users may construct additional databases themselves. The database may also capture data from other subsystems such as marketing, production & personnel.

3. **Planning Languages:** Their types are as under:

(i) **General-Purpose planning languages:** These languages allow the users to perform many routine tasks & enable them to tackle a broad range of budgeting, forecasting & other worksheet-oriented problems.

(ii) **Special-Purpose planning languages:** These languages are more limited in what they can do but they do certain jobs better than the general-purpose planning languages.

4. **Model base:** It is the “Brain” of DSS because it performs data manipulations & computations with the data provided to it by the user & the database.

31. What are the levels in which Database is implemented in a DSS?

Nov 2010

Ans. 1. **Physical Level:** It involves the implementation of the database on the hard disk.

2. **Logical Level:** It is designed by professional programmers who have complete knowledge of DBMS. It deals with:

- (i) The Nature of data stored
- (ii) The Scheme of the data
- (iii) The Storage, which is logically divided into various tables having rows & columns
- (iv) The Techniques for defining relationships with indexes.

3. **External Level:** The Logical level defines Schema which is divided into smaller units known as Sub-Schema & given to the managers. Each Sub-schema contains all the relevant data needed by one manager.

32. DSS are widely used as a part of an organisation's accounting info system (AIS). Give example to support this statement.

Ans. A DSS is generally developed to solve specific problems. Which can be illustrated as below:

1. **Cost Accounting System:** The Cost Accounting applications help business in ascertaining cost, price, quotations budgeting etc.

For instance: It helps health care Organisations to calculate product costs for individual procedures or services.

2. **Capital Budgeting System:** It provides tools (like NPV, IRR etc) to evaluate investments decisions. **Automan** is a DSS designed to support investment decisions in automated mfg technology. It allows decision makers to consider financial, non-financial, quantitative & qualitative factors in their decision-making process.

3. **Budget Variance Analysis System:** It assists in controlling costs & evaluating managerial performance. A Computerized DSS can be used to generate monthly variance reports, to draw graphs and to view, analyze & comment on budget variances. It may also be used to create one & five year budget projections using the forecasting tools provided in the system.

4. **General DSS:** Here, the user needs to input data & answer questions about a specific problem domain to make use of this type of DSS. **Example - Expert Choice** is a program which supports a variety of problems requiring decisions. It analysis the judgments & presents the decision maker with the best alternative.

33. What are the Characteristics/Features of EIS?

May 2011; Nov 2012

(i) EIS is a CBIS that serves the info needs of Top Executives.

(ii) It enables the users to extract summary data & model complex problems **without need to learn query languages**, statistical formulas or high computing skills.

(iii) It **provides rapid access** to timely info & direct access to mgt reports.

(iv) It is capable of **accessing both internal & external data**.

(v) It **provides extensive online analysis tool** like trend analysis, mkt conditions etc.

(vi) It can easily be given a DSS support for decision making.

34. Who is an Executive? What is the Role of Executive in Decision-Making?

Ans. An Executive is a manager at/near the top level who exerts a strong influence on the course taken by the firm. Most Executive decisions fall into following three categories:

1. **Strategic Planning:** It involves determining the general, long-range direction of the organization. The CEO is ultimately responsible for the development of strategic plans.

2. **Tactical Planning:** It refers to how, when, where & what issues involved with carrying out the strategic plan. Although, the executives do not normally concerned with the tactical details but still they worry about the general tactics.

3. **Fire Fighting:** Major problems require attention of managers at executive level.

Example- If a company is involved in a big lawsuit that threatens its financial solvency, an executive must get involved.

In addition to planning & fire-fighting, executive mgt also needs to exert some general control over the organization.

35. Successful Executives may take decisions relying more on intuition than on any quantitative analytical decision technique. Mention five Characteristics of the types of info that are responsible for this phenomenon in Executive decision-making.

May 2010

Ans. Often, executives make decisions based on a vision so as to make their companies successful. That is why; executives rely much more on their own intuition than on the sophisticated analytical skills. The intuitive character of executive decision-making is reflected in the types of info found most useful to executives.

Characteristics of Executive Decision-making:

1. **Lack of structure:** Many of the decisions made by the executives are relatively unstructured. These types of decisions are not as clear-cut as deciding how to debug a computer program.

2. **High degree of uncertainty:** Executives work in a decision area that is often characterized by a lack of precedent or where results are not precisely predictable from actions.

3. **Future Oriented:** Executives are responsible to make sure that the organization keeps pointed toward the future.

For Instance - How will future technologies affect what the company is currently doing? What will the govt do next? What products will consumers demand five years from now?

4. **Informal Source:** Executives rely much more on the informal source for important info.

For Example - Lunch with a colleague in another firm might reveal some important competitor strategies.

5. **Low level of detail:** Executives take decisions based on trends. This requires the executive to be more aware of the large overview than the tiny items.

36. In what ways an EIS differ from the traditional info system?

May 2013

Basis of Difference	Traditional Info System	EIS
Info sources	Internal	More External less Internal
Level of Mgt	For Lower Staff	For Top or near Top Executives
Nature of info provided	Offline status reporting	Online tools & analysis
Drill down facility to go through details at successive	Not available	Available
Info Format	Tabular	Text with graphics
Nature of Interface	Computer-operator generated	User-friendly

37. Discuss the general guidelines to design the measures & indicators of an EIS. Nov 2007; RTP May & Nov 2012 & Nov 2013

Ans. EIS measures must be:

- (i) Easy to understand & collect.
- (ii) Based on the balanced view of the organisation's objective.
- (iii) Available to everyone in the organisation.
- (iv) Developed to meet the changing needs of the organisation.
- (v) Able to encourage mgt & staff

Performance Indicators:

- (i) Must reflect everyone's contribution in a fair & consistent manner.
- (ii) Should be independent as possible from variables outside the control of managers.
- (iii) Must promote both team-work & friendly competition.

38. What are Expert systems? List the Properties which an application should possess to qualify for Expert System Development - May 2013

Meaning: (i) ES is a highly developed DSS that utilizes knowledge generally possessed by a Human Expert to solve the problem.

(ii) ES provide decision makers with the type of advice they would receive from a Human Expert.

Major properties that potential applications should possess to qualify for ES development are as follows:

1. **Availability** - One or more experts should be available who are capable of communicating how they go about solving the problems.
2. **Complexity** - ES provide solution to complex problems that require logical inference processing which would not be normally handled by conventional info processing.
3. **Domain** -The domain or subject area of the problem is relatively small & limited as compared to a well defined problem area.
4. **Expertise** - Solution to the problems provided by ES should be as it was provided by experts because only a few persons possess the knowledge, techniques & intuition required for solving the problems
5. **Structure** -The solution process of ES must be able to cope with ill-structured, uncertain, missing & conflicting data.

39. Write short notes on business applications of Expert Systems for Mgt Support Systems.

May 2011; RTP May 2012

Area	Applications/Examples
Accounting & Finance	ES provides advices on issues like Tax computation, Investment decisions, Credit Authorization decisions etc.
Marketing	It provides establishing Sales-Quotas, responding to Customer-Inquiries etc
Manufacturing	It assists Product designing, analyzing quality, selecting Transportation routes etc.
Personnel	It helps in assessing applicant's qualifications, filling out forms etc.
General Business	It assists in acquisition strategies, educating trainees, evaluating performance etc

40. Why is there need for Expert Systems?

Ans. (i) Expert labour is expensive & scarce.

(ii) Humans can handle only a few factors at a time.

41. List the Benefits of Expert Systems.

Nov 2010

Ans. (i) It **Preserves knowledge** that might be lost through expert's retirement, death, resignation etc

(ii) It puts info into an active-form so it can be called as **Real-Life Expert**.

(iii) It **assists Novices** in thinking.

(iv) It is not subject to such **Human Limitations** such as fatigue, being too busy or being emotional.

(v) It can be effectively used as **Strategic Tool** in the areas of marketing.

42. Briefly explain the components of Expert Systems.

Knowledge Base	(i) It stores the Rules, Data & Relationships that are used to solve problems & contain specific facts about the expert area. (ii) With such a system, a set of rules must be developed to bridge the knowledge bases & to resolve the conflicts. (iii) The knowledge acquired from the expert has to be represented formally by using Representation Techniques like Production Rule Systems, a Structured Object & Predicate Calculus or Logic. (iv) The Power of a system depends on the Depth & Breadth of Knowledge in the KB.
Inference Engine	(i) It is the main processing element consisting of system of programs that requests data from the user, manipulates the KB & provides a decision to the user.

	(ii) It performs this task to deduce new facts which are then used to draw further conclusions. (iii) It is the active component of an expert system since it steers through knowledge & progresses the whole interaction.
Knowledge Acquisition Subsystem	(i) It is a software component of an Expert System that enables the Knowledge Engineer (KE) to build & refine an Expert System KB since the KE is a specialized System Analyst who is responsible for designing & maintaining the expert systems. (ii) KB development & maintenance can be done using user-friendly software that provides easy-to-operate menus & templates for entering rules, facts & relationship among facts.
User-Interface	(i) It is the method by which an expert system interacts with a user. These can be done through Dialog Boxes, Command Prompts, Forms or Other Input Methods. (ii) The ES prompts the user to supply info about the problem & the user types in the requested data. (iii) The data entered by the user are then examined by the inference engine & compared to the facts, rules & relationship in the KB that helps to reach a conclusion.

43. What are the types of Office Activities/Operations which can be automated?

Nov 2010

- Ans. (i) Document Capture** i.e. preservation of documents originating from outside sources like incoming mails, notes, handouts, charts, graphs etc.
- (ii) Document Creation** i.e. preparation of documents, letters, dictation, editing of texts etc.
- (iii) Receipt & Distribution** i.e. handling & distribution of correspondence to designated recipients.
- (iv) Filing, Search, Retrieval & Follow up** i.e. filing, searching & follow up of documents.
- (v) Calculations:** These include the usual calculator functions like routine arithmetic, operations for bill passing, interest calculations etc.
- (vi) Recording utilization of Resources:** This includes record keeping in respect to specific resources utilized by office personnel.

44. What are the benefits of OAS?

- Ans. (i)** Improved communication within & between Organizations
- (ii)** Reduced cycle time between preparation & receipt of messages at the recipient's end.
- (iii)** Reduced cost of communication **(iv)** Ensures accuracy of communication flows.

45. Write short notes on Text Processing Systems.

Meaning: Text processing systems are the most commonly used components of OAS. This is so because a large proportion of office communication takes place in writing using words of natural language.

Features of Text Processing Systems:

- (i)** Text processing systems automate the process of development of documents such as letters, reports; memos etc. They permit use of standard stored info to produce personalized documents. Such automation reduces keying effort & minimizes the chances of errors in the document.
- (ii)** The text processors may be simple word processing systems or desktop publishing systems. The DTP systems help in quick production of multiple copies of document with quality printing. The DTP systems are often supported with laser printers, inkjet printers, scanners & other such devices for producing good quality documents.

46. Explain the Features of Electronic Document Mgt Systems (EDMS).

- (i)** EDMS assists in capturing the info contained in documents, stored for future reference & communicates to the users as & when required.
- (ii)** These systems are very useful in **Internal Communication** & in **Remote Access of Documents**. Therefore, the location of Executives becomes irrelevant for access to documents.

47. What are the various Components of Electronic Message Communication Systems?

1. E-Mail
2. Facsimile (FAX)
3. Voice Mail

48. Explain the Features of E-Mail.

Nov 2012

- (i)** Electronic Transmission
- (ii)** Online Development & Editing
- (iii)** Broadcasting & Re-routing
- (iv)** Integration with other systems
- (v)** Portability
- (vi)** Economical

49. Write short notes on FAX.

It is an electronic communication of images of documents over the telephone lines. The computer based FAX technology automates FAX communication & permits sharing of FAX facilities. It uses FAX servers to send & receive FAX messages.

50. Write short notes on Voice Mail.

This provides transmission of messages as digitized voice. The recipient of voice mail has to dial a voice mail service or access the e-mail box using the specified equipment & he can hear the spoken message in the voice of sender.

51. Write short notes on Teleconferencing & Video-conferencing systems.

Teleconferencing refers to electronic meetings that involve people at different physical locations. It may be of audio or video type with or without use of computer systems. Although, the computer based teleconferencing has the advantage of flexibility in terms of pre-recorded presentations & integration with other info systems.

Video-conferencing uses Display screens, video cameras & communication systems to link participants based at different locations. In this case, participants can hear & see each others.

Important Note: Please read the topic ERP from “CHAPTER 7”.

KAPIL SABHARWAL, PH:-9988213131

Chapter 2 - System Development Life Cycle Methodology

Que. What is System Development and Explain briefly the System development process?

Ans. Meaning of System Development: It refers to the process of examining a business situation with the intent of improving it through better procedures & methods.

System Development Process: Whenever mgt or system development personnel realize that a particular system needs improvement or they want to change the old info system with a new & improved info system, a process starts in the organisation which is known as system development process. It has two major Components:

1. **System Analysis:** Under this, the requirements for which the system is to be developed are thoroughly analysed by collecting various facts & figures in terms of features & problems of existing system. This analysis provides improvement over the existing system & meets all the specified requirements of new system.
2. **System Design:** It provides the design of all the required features of new system in the flowcharts & flow diagrams etc. It can be said as a **Blue Print of the system** to be developed.

Que. What is System development methodology? Explain its features/characteristics.

Ans. Meaning: (i) A system development methodology is a formalized, standardized & documented set of activities used to manage a system development project.

(ii) It refers to the framework which is used to structure, plan & control the process of developing an info system.

The methodology is characterized by the following:

- ❖ **Division of Project:** The project is divided into a no. of identifiable processes which facilitates both project planning & project control. Each process has a starting & ending point and comprises of several activities, one or more deliverables & several mgt control points.
- ❖ **Deliverables:** Specific reports & other documentation called **Deliverables** must be produced periodically during system development so as to make development personnel accountable for the faithful execution of system development tasks.
- ❖ **Sign-offs:** Users, managers & auditors are required to participate in the project. Their participation generally provides approvals of development process & the system being developed, often called sign offs.
- ❖ **System Testing:** The system must be tested thoroughly prior to implementation to ensure that it meets users' needs.
- ❖ **Training Plan:** A training plan is developed for those who will operate & use the new system.
- ❖ **Controls:** Formal program change controls are established to preclude unauthorized changes to computer programs.
- ❖ **Post-implementation Review:** A PIR of all developed systems must be performed to assess the effectiveness & efficiency of the new system & of the development process.

Que. Explain the SDLC framework. Also outline the general advantages of SDLC methodology

Ans. Meaning: (i) This framework provides the system designers & developers to follow a sequence of activities that consists of a set of steps/phases in which each phase uses the result of previous phase.

(ii) The SDLC is **Document driven** which means that at crucial stages during the process, documentation (Also called artifact/Deliverables) is produced.

(iii) A phase is not complete until the deliverable is produced.

(iv) **Deliverable** - A deliverable may be a substantial written document, a software artifact, a system test plan or even a physical object

General Advantages of SDLC Methodology:

- Better planning & control by project managers.
- Compliance to prescribed standard ensuring better quality.
- Documentation that SDLC stresses on, is an important measure of communication & control.
- The phases are important milestones that help the project manager & the user for review & signoff.

Que. Outline the advantages of SDLC Methodology from the viewpoint of IS Audit.

{Nov 2010, Nov 2012}

Ans. (i) On the basis of detailed documentation created during each phase of SDLC, The IS Auditor can have **clear understanding of various phases of SDLC.**

(ii) On the basis of his examination, The IS Auditor can state in his report about the **compliance of procedures by IS mgt.**

(iii) On the basis of technical knowledge & ability of the area of SDLC, the **IS Auditor can be a Guide** during the phases of SDLC.

(iv) The IS Auditor can provide an evaluation of the methods & techniques used through the various development phases of the SDLC.

Que. What are the risks associated with SDLC?

Ans. (i) The development team may find it cumbersome.

(ii) The user may find that the end product is not visible for a long time.

(iii) The rigidity of the approach may prolong the duration of many projects.

(iv) It may not be suitable for small & medium sized projects.

Que. Bring out the reasons as to why the firms fail to achieve their system development objectives?

{RTP Nov 2003}

Ans. 1. Lack of senior mgt support & involvement in info system development

2. Lack of user participation

3. Lack of standard project mgt & system development methodologies

4. New technologies

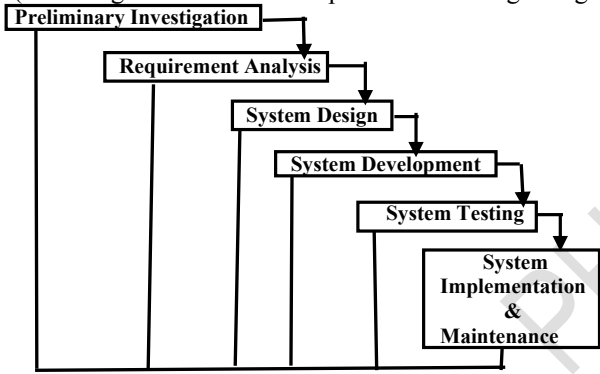
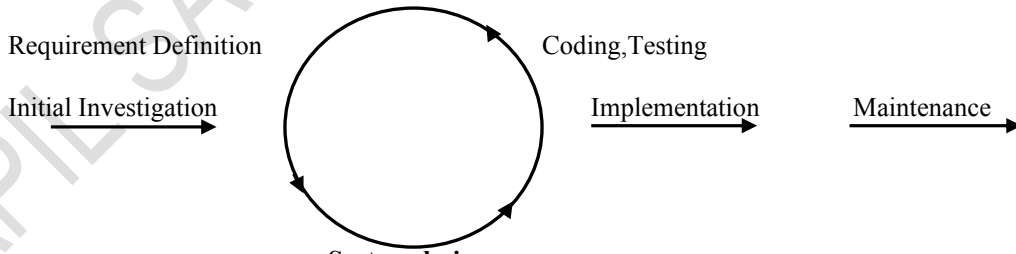
5. Shifting user needs

6. Overworked or under-trained development staff
7. Resistance to change
8. Inadequate testing & user training
9. Unstructured strategic decision-making

Que. Explain the various Approaches to System Development in detail.

{V.Imp}

Ans.

Approach	Concepts
Waterfall (linear) RTP May 2012	Basic Principles: 1. Division of project into sequential phases: The project is divided into sequential phases and some overlap & splash back is accepted b/w the phases. 2. Emphasis: The emphasis is given on planning, time schedules, target dates, budgets & implementation of the entire system at one time. 3. Maintaining Tight Controls: Tight are maintained over the life of the project through - ➤ the use of extensive written documentation ➤ Formal reviews & approval signoff by the user and ➤ IT mgt (occurring at the end of most phases before beginning of next phase)  Strengths: (i) An orderly sequence of development steps ensure the quality, reliability, adequacy & maintainability of the developed software. (ii) Ideal for supporting less experienced project teams & project managers or for project team whose composition fluctuates. (iii) Progress of system development is measurable. (iv) Conserve Resources. Weaknesses: (i) Inflexible, slow, costly & cumbersome due to tight controls. (ii) Project moves forward with little backward movement. (iii) Problems are often not discovered until system testing. (iv) System performance can't be tested until the system is fully coded. (v) Difficult to respond to changes that occur later in the life cycle. Fig. Steps in Traditional Approach
Prototyping (Iterative) RTP May 2012; {May 2013}	Basic Principles: Prototyping can be viewed as a series of four steps which are : Step 1 - Identifying info system requirements: Under Prototyping approach, the design team requires only the fundamental system requirements to build the initial prototype. The process of determining these requirements is less formal & less time-consuming under this approach as compared to that under traditional approach. Step 2 - Developing the Initial Prototype: In this step, the designers create an initial base model & give little or no consideration to the internal controls but instead emphasize such system characteristics such as simplicity, flexibility & ease of use. Step 3 - Testing & Revision: After finishing the initial prototype, the designers first demonstrate the model to the users & then give it to them to experiment & ask users to record their likes & dislikes about the system & recommend changes. Step 4 - Obtaining user signoff of the approved Prototype: At the end of Step 3, users formally approve the final version of the prototype, which commits them to the current design & establishes a contractual obligation about what the system will & will not do or provide.  Fig. Prototyping Model Strengths: (i) It improves the user participation in system development. (ii) It is useful in determining user's exact requirements from the system. (iii) It encourages innovation & flexible designs. (iv) It provides quick implementation of an incomplete but functional application. (v) Errors are detected & eliminated early in the developmental process. Weaknesses: (i) Prototyping can only be successful if the system users are willing to devote their significant time in experimenting with the prototype & provide the system developers with change suggestions, But it may possible that the users may either be not able or not willing to spend their time for such purpose.

	(ii) Prototype may not have sufficient checks & balances incorporated. (iii) Frequent changes in user requirements may cause delay or over cost the system. (iv) Prototyping may cause behavioral problems with system users like - Dissatisfaction by users if the system developers are unable to meet all user needs/demands; Dissatisfaction & impatience by users when they have to go through too many interactions of the prototype. (v) Sometimes, the system designers build prototype too quickly, without sufficient upfront user needs-analysis resulting in an inflexible design that limits future system potential.
Incremental (Combination of Linear & Iterative)	Basic Principles: Under this approach, the system is designed, implemented & tested incrementally, until it is finished. The product is decomposed into a no. of components, each of which are designed & built separately. Each component is delivered to the client when it is complete. Thus, this approach allows partial utilization of product & avoids a long development time. Under this approach, system may be developed in any of the following ways: (i) A series of mini-waterfalls may be performed, where all the phases of system development are completed for a small part of the system, before proceeding to the next increment. or (ii) Overall requirements may be defined before proceeding to the evolutionary, mini-waterfall development of individual increments of the system. or (iii) The initial software concept, requirement analysis and design of architecture & system core may be defined using the waterfall approach, followed by iterative prototyping, which culminates in installation of the final prototype i.e. the working system. <pre> graph TD A[Requirements] --> B[Design] B --> C[Implementation & Unit Testing] C --> D[Integration & System Testing] D --> E[Operation] E --> A </pre> Fig. Incremental Model Strengths: (i) The effects of incremental changes, isolated issues etc are noticed earlier in the project which assists in making necessary adjustments before the organisation is adversely affected. (ii) The knowledge gained in earlier increments are used in developing later increments. (iii) It helps to mitigate the risks of integration & architecture earlier in the project. (iv) Less costly to change scope & requirements. (v) More Flexible (vi) The stakeholders may be provided the evidence of project status throughout the life cycle. Weaknesses: (i) Each phase of iteration is rigid & do not overlap each other. (ii) Well-defined interfaces are required due to early development of some of the modules. (iii) Difficult problems may be pushed to the future to demonstrate early success to the management. (iv) There may be lack of overall consideration of the business problem & technical requirements for the overall system because of utilizing a series of mini-waterfalls for a small part of the system.
Spiral Model (Combination of Linear & Iterative) {Nov 2010}	SPIRAL MODEL Basic Principles: RTP May 2013 Defining New System Requirements - The new system requirements must be defined in as much detail as possible. It involves interviewing a no. of users representing all the external or internal users & other aspects of the existing system. Creating a Preliminary Design for new system - Under this phase, all possible alternatives that can help in developing a cost effective project, are analysed & strategies are decided to use them. This phase also helps to identify & resolve all the possible risks in the project development. Constructing First Prototype - A first prototype of new system is constructed from the preliminary design. This is usually a scaled-down system & represents an approximation of the characteristics of the final product. Constructing Second Prototype - Procedure for constructing second prototype is as follows: (i) Evaluating the first prototype in terms of its strengths, weaknesses & risks; (ii) Defining the requirements of the second prototype; Strengths: (i) It enhances the risk avoidance. (ii) On the basis of project risk, this approach can be useful in : - Selecting the best methodology to follow for development of a <u>given software iteration</u> ; - Incorporating the Waterfall, Prototyping & Incremental methodologies in the framework and providing guidance as to which combination of these models best fits a given software iteration. Weaknesses: (i) Since this approach is highly customized to every project, so it has limited re-usability. (ii) A skilled & experienced project manager is required to determine how to apply it to a given project. (iii) There are no established controls for moving from one cycle to another cycle. Without controls, each cycle may generate more work for the next cycle. (iv) Due to no firm deadlines, cycle continues with no clear termination condition, so there is an inherent risk of not meeting the

	budget or schedule.
Rapid Application Development (RAD) - Iterative	Basic Principles: (i) The project is divided into smaller segments which provides more ease-of-change during the development process. (ii) It aims to provide a high quality software rapidly, primarily through the use of : ❖ Iterative Prototyping ❖ Active User-involvement ❖ Computerized Development Tools such as - GUI builders, CASE tools, DBMS, Fourth generation programming languages, Code generators & Object-oriented techniques etc. (iii) This approach generally includes Joint Application Development (JAD), where users are involved in system design either through consensus building in structured workshops or through electronically facilitated interaction. (iv) The key emphasis is on fulfilling the business needs, while technological or engineering excellence is less important. (v) The documentation required to facilitate the future development & maintenance are produced. (vi) A functioning software is produced iteratively rather than producing a throwaway prototype. Key Objective: Fast development & Delivery of a high quality system at a relatively low investment cost. Strengths: (i) The operational version of an application is available much earlier than with Waterfall, Incremental or Spiral frameworks. (ii) Low development cost due to quick production of working system. (iii) Quick initial reviews are possible. (iv) It provides the ability of rapidly change the system design when demanded by the users. (v) It provides for saving in time, money & human effort. Weaknesses: (i) More speed & lower cost may lead to a lower overall system quality. (ii) Due to missing info, there is always a danger of misalignment of developed system with the business. (iii) Project may end-up with more requirements than needed (Gold-Plating). (iv) There is always a tendency for difficult problems to be pushed to the future to demonstrate early success to management. (v) Since some modules develop much earlier than others, therefore, well-defined interfaces are required. (vi) Modules developed are difficult to reuse for future systems.
Agile Methodology (Iterative & Incremental)	Meaning: It is a group of software development methodologies based on iterative & incremental development involving collaboration between teams. It promotes adaptive planning & encourages rapid & flexible response to change. It is a conceptual framework that promotes foreseen interactions throughout the development life cycle. Basic Principles: (i) Simplicity (ii) Self-organising teams (iii) Regular adaptation to changing circumstances (iv) Welcome changing requirements, even late in development life cycle. (v) Face-to-Face Conversation & close co-operation between developers & users RTP Nov 2012, RTP Nov 2013 (vi) Continuous attention to technical excellence & good design (vii) Customer satisfaction by rapid delivery of useful software Strengths: ❖ This methodology has the concept of an adaptive team, that is why, it is able to respond to the changing requirements. ❖ Quick delivery of product without requiring to invest much time & effort even when the users requirements are changing. ❖ Face to Face communication & continuous inputs from customer representative leaves no space for guesswork. ❖ Clearly defined & to the point documentation saves time. ❖ The end result is the High quality software in least possible time that ensures customer satisfaction. Nov 2013 Weaknesses: ❖ In case of large software deliverables, it becomes difficult to assess the efforts required at the beginning of the software development life cycle. ❖ There is lack of emphasis on necessary designing & documentation because the team focuses on verbal communication with the customer rather than on documents or manuals. ❖ Agile requires more re-work when (i) There is lack of long term planning & lightweight approach to architecture and (ii) when the various components of the software are combined & forced to interact. ❖ The project can get taken off-track if the customer representative is not clear about the final outcome that they actually require. ❖ Only senior programmers are capable of taking right decisions during the development process, so, there is no or less scope for newly appointed programmers unless they are combined with experienced resources.

Que. State & briefly explain the six stages of system development life cycle (SDLC)

{Nov 2008}

Ans. SDLC: It is a set of six activities which are closely related to each other. After a certain stage, these activities can be done parallel to each other. The six stages of SDLC are briefly explained below:

1. **Preliminary Investigation:** When the user comes across a problem in the existing system or a totally new requirement for computerization, a formal request has to be submitted for system development. It consists of three parts: **Request classification, Feasibility study and Request approval.** Feasibility study is conducted after the receipt of request & identification of needs are carried out. It includes the aspects related to Technical, Economic & Operational feasibility and is normally conducted by a

third party depending upon the quantum & size of the requirements. The Approval is sought from Top mgt to initiate the system development.

2. **Requirement Analysis or System Analysis:** Once the request of the system development is approved, the detailed requirement study is conducted in the close interaction with the concerned employees & managers.

3. **System Design:** Under this activity, the system analyst designs the various procedures, report, inputs, files & database structures and prepares the comprehensive system design. These specifications are then passed on to the development team for program coding & testing.

4. **Acquisition & Development of Software:** Once the system design details are resolved & SRS is accepted by the user, the hardware & software details along with service requirements are determined & procured choosing the best-fit options. Subsequently, choices are made regarding which products to buy or lease from which vendors.

5. **System Testing:** Once all the programs comprising the system have been developed & tested, the system needs to be tested as a whole in a order to ensure that it does not fail in any condition.

6. **Implementation & Maintenance:** After accomplishment of above activities and ensuring that the requisite hardware & software are installed & the users are trained on the new system to carry out operations independently, the system is implemented and it is maintained & modified to adapt to the changing needs of the users.

Que. What are the Steps involved in Preliminary Investigation?

Ans. 1. Identification of problem: (i) The first step in an application development is to **define the problem** clearly & precisely (ii) Next step is **assessing the prevalence of problem within organisation**. A problem that has considerable impact on the organisation is likely to receive immediate mgt action.

(iii) **Need for new system** may arise due to shifting business requirements, changing organisational environments & evolving IT.

(iv) If the need seems to be genuine, the **System analyst will submit all proposals to the Steering Committee** for evaluation to identify those projects that are most beneficial to the organisation.

2. **Identification of Objective:** After the identification of problem, it is easy to work out the objectives of the proposed solution.

For instance- The problem of Railways was the inability to provide a convenient reservation system for a large no. of intending passengers. So its Objective should be "to provide a system wherein intending passengers could book a ticket from source to destination, faster than in a real-time."

3. **Delineation of Scope:** (Delineating means describing precisely) The scope of a solution defines its boundaries. It should be clear & comprehensive to the user mgt stating what will be addressed by the solution & what will not. Hence, outlining the scope in the beginning is essential. **The following questions should be answered while stating the scope: (Separate Question may be asked)**

(i) What functionalities will be delivered through the solution?

(ii) What data is required these functionalities?

(iii) What are the control requirements for this application?

(iv) What level of response time, execution time & throughput is required?

(v) What are the conditions, the input data has to conform?

(vi) Is there any special hardware/software that the application has to interfaced with?

While eliciting/obtaining info to delineate the scope, following aspects need to be kept in mind: RTP Nov 2012, RTP Nov 2013

(i) Different users will represent the problem & required solution in different ways. Therefore, the system developer should elicit the need from the initiator of the project who may be the member of the senior mgt.

(ii) An understanding of the profile of users at operating level helps in designing appropriate user interface features.

(iii) The development organisation has to clearly quantify the economic benefits to the user organisation. But other factors should also be given weight-age. **For Example-** In a security system, how foolproof (means unable to go wrong) it is may be a critical factor.

(iv) An understanding of the impact of the solution on the organisation is also necessary.

The two primary **Methods with the help of which the scope of the project can be analysed** are as follows: **{RTP May 2013}**

(i) **Reviewing internal documents:** The analysts conducting investigation try to learn about the organisation involved in or affected by the project. They can learn these details by examining organisation charts & studying written operating procedures. **Written documents tell the analyst how the system should operate.**

(ii) **Conducting Interviews:** Analysts conduct interviews to know more about the nature of the project request & the reasons for submitting it.

4. **Feasibility Study (June 2009):** After possible solution options are identified, the project feasibility is determined by the system analyst. It refers to a process of evaluating alternative systems through cost-benefit analysis so that the most feasible & desirable system can be selected for development.

The following issues are typically addressed in the feasibility study:

RTP Nov 2012, RTP May 2013

(i) Determine whether the existing system can rectify the situation without a major modification.

(ii) Define the time frame for which the solution is required.

(iii) Determine the approximate cost to develop the system.

(iv) Determine whether the vendor product offers a solution to the problem.

(v) Determine whether the solution is as per the business strategy.

The feasibility study of a system is evaluated under following dimensions:

(i) **Technical:** It is concerned with hardware & software. The technical issues usually raised during the feasibility stage of investigation are as follows;

- Does the necessary technology exist to do what is suggested (and can it be acquired)?
 - Does the proposed equipment have the technical capacity to hold the data required to use the new system?
 - Will the proposed system provide adequate responses to inquiries regardless of no. or location of users?
 - Can the system be expanded if developed?
- (ii) **Economic Feasibility:** It includes an evaluation of all the costs & benefits expected if the proposed solution is implemented. The financial & economic questions raised by analysts during the preliminary investigation are as follows:
- The cost of conducting system investigation.
 - The cost of hardware & software needed.
 - The benefits in the form of reduced costs.
 - The cost if nothing changes.
- (iii) **Financial Feasibility:** The proposed solution may be costly which may be acceptable for an organisation with high turnover but may not be a viable solution for small organizations.
- (iv) **Operational Feasibility:**
- It is concerned with ascertaining the views of workers, employees, customers & suppliers about the use of computer facility. Some of the questions which help in testing the operational feasibility of a project are as under:
- Is there sufficient support for the system from mgt/users?
 - Is there any resistance for use of proposed system?
 - Are current business methods acceptable to users?
 - Will the proposed system produce poorer results in any aspects or areas?
- (v) **Schedule Feasibility:** It involves the design team's estimation on how long will it take a new system to become operational & communicated this info to the steering committee.
- (vi) **Legal feasibility:** It is concerned with whether there will be any conflict between a newly proposed system & the organisation's legal obligations.
- (vii) **Resources Feasibility:** This focuses on human resources. Implemented sophisticated software solutions become difficult in non-metro locations because of reluctance of skilled personnel to move to such locations.
5. **Reporting results to Mgt:** After describing the problem & its scope, the system analyst proves one or more solution alternatives & estimates the cost & benefits of each alternative & reports these results to the mgt. From the analyst's report, mgt should determine what to do next. From the projects submitted for evaluation & review, the projects that meet the selection criteria are accepted & requests that fail to pass the feasibility test are re-worked & re-submitted as new proposals.

RTP Nov 2013

Que. Explain the concept of cost Benefit Analysis during Preliminary Investigation.

{Nov 2005}

Ans.

Costs	Benefits that can result from the development of Computerized system {May 2012}
Development Costs: For a CBIS, development costs include costs of system development process, such as (i) Salaries of system analysts & computer programmers who design & program the system. (ii) Costs of converting & preparing data files and preparing system manual & other supportive documents (iii) Costs of preparing new or expanded computer facilities. (iv) Costs of testing & documenting the system, training employees & other start up costs. Operating Costs: For a CBIS, this costs include: (i) Hardware/Software rental or depreciation charges (ii) Salaries of Computer Operators & other data processing personnel who will operate the new system. (iii) Salaries of System Analysts & Computer Programmers who perform the system maintenance. Intangible Costs: Such costs can not be easily measured. For example: (i) The development of new system may disrupt the activities of an organisation & cause a loss of employee productivity or morale. (ii) Customer sales & goodwill may be lost by errors made during the installation of new system.	Tangible Benefits are those that can be accurately measured & are directly related to the introduction of new system, like- (i) Decrease in ➤ Data processing costs ➤ Operating costs ➤ Required Investments (ii) Increase in ➤ Sales or profits ➤ Operational ability & efficiency (iii) Improved ➤ Info availability ➤ Abilities in computation & analysis ➤ Customer Service ➤ Employee Morale ➤ Mgt decision-making ➤ Competitive position Intangible Benefits are harder to measure & define but they should be used in monetary terms to use them in financial reports. Eg. Improved Business Image

Que. What are the activities to be performed during System Requirement Analysis Phase {May 2011; RTP May 2012; May 2013}

- Ans.**
- (i) Identifying & consulting the stake owners to determine their expectations & resolving their conflicts.
 - (ii) Analyzing requirements to detect & correct conflicts and determining the priorities.
 - (iii) Verifying that the requirements are complete, consistent, verifiable, modifiable, testable & traceable.
 - (iv) Gathering the data or finding facts using tools like- Interviewing, Questionnaires, Observation etc.

(v) Documenting activities such as Interview, Questionnaire, Reports etc & Developing a System (Data) Dictionary.

(vi) Developing Models to document Data Flow Diagram etc.

Que. Briefly discuss various Fact Finding Techniques used by the System analyst for Determining the Users' requirements/needs of the organisation.

{May 2010}

Ans. Every system is built to meet some set of needs. To assess these needs, the Analysts often interact with the people (who will be benefited from the system) in order to determine their actual requirements. Various Fact Finding Techniques are as under:

1. **Documents:** These are the good source of info about user needs & the current system. These includes:
 - Manuals, Input forms, Output forms, Diagrams - showing how the current system works.
 - Organisation Charts - showing the hierarchy of users & manager's responsibilities.
 - Job description of the people - who work with the current system
 - Program codes - for the applications associated with the current system.
2. **Questionnaires:** These are the set of pre-decided questions about the working of info system. These are given to the users & managers to fill, in order to obtain their responses from the info system.
3. **Interviews:** Users & managers may also be interviewed to obtain info in detail. The data gathered through the interviews provide the system developer with a complete picture of the problems & opportunities.
4. **Observation:** In Prototyping approaches, observation plays an important role in the requirement analysis. Only by observing users' reaction to the prototypes, the system developer can develop a better system.

Que. Discuss in brief, the various functional areas to be studied by a system analyst for a detailed investigation of Present System.

{May 2011, Nov 2011}

Ans. Detailed investigation of present system involves collecting, organising & evaluating facts about the system & the environment in which operates. Appropriate Info should be gathered so as to enable a qualified person to understand the present system without visiting any of the operating departments. For this purpose, following areas should be studied in depth:

1. **Review Historical Aspects:** A brief history of the organisation is the starting point for an analysis of the present system. The System analyst should review Annual Reports, Organisation Charts etc to identify the growth of mgt levels, development of various functional areas & departments. He should investigate what system changes have occurred in past that have been successful or unsuccessful with computer equipment & techniques.
2. **Analyze Inputs:** Analyses of present inputs are the basis for manipulation of data. The system analyst should be aware of the various sources from where the data are initially captured since the outputs for one area may serve as an input for another area.
3. **Review Data-files maintained:** The system analyst should investigate the data-files maintained by each deptt, noting their no. & size, where they are located & used. Such info may be contained in system & procedure manuals. He should also review all on-line & off-line files as it reveals info about data that are not contained in any outputs.
4. **Review Methods, Procedures & Data Communications:** A Method is defined as "a way of doing something" and Procedure is defined as "a series of logical steps by which a job is accomplished".

A procedure review is an intensive survey of :	Data Communication review involves reviewing :
➤ The methods by which each job is accomplished ➤ The equipment utilized and ➤ The actual location of the operations. Its basic Objective is to eliminate un-necessary tasks or to perceive important opportunities in the present info system.	➤ Data interface ➤ Data links ➤ Modems ➤ Dial-up ➤ Leased lines and ➤ Multiplexers Its basic Objective is to understand how the data - communication network is used in the present system so as to identify the need to improve the network when the new system is installed.

5. **Analyze Outputs:** Its Objective is to determine how well the outputs or reports meet the organisation's needs. The system analyst must understand what info is needed & why and when & where it is needed. Reports carried over from earlier years that have no more relevance, should be eliminated in the new system.

6. **Review Internal Controls:** Such review helps the system analyst to visualize the essential parts & framework of a system. An examination of the internal controls of the present system may indicate the weaknesses that should be removed in the new system.

7. **Model the existing physical system & logical system:** The system analyst should prepare the system flow charts, data flow diagrams etc as these diagrams/models help to present the complete description of the existing system in terms of data flows, processes & outputs.

8. **Undertake overall analysis of present system:** Based upon the aforesaid investigation of the present info system, the final phase of the detailed investigation includes the analysis of :

- The present work volume
 - The current personnel requirements and
 - The present costs & benefits
- Each of these must be investigated thoroughly.

Que. How is the System Analysis of a Proposed System is carried out?

Ans. After each functional area of the present info system has been carefully analysed, the proposed system specifications must be clearly defined. Consideration should be given to the strengths & weaknesses of the present system.

The required system specifications (i.e set of requirements to be satisfied by proposed system) which should be in conformity with the project's objectives **are as follows:**

- **Outputs** should be produced with great emphasis on timely managerial reports.
- **Database** should be maintained with great emphasis on on-line processing capabilities.
- **Input data** should be prepared directly from the original source documents for processing by the computer system.
- **Methods & Procedures** should show the relationship of inputs & outputs to the database wherever required.
- **Work volumes & timings** should be carefully addressed for present & future periods including past periods.

Procedure/Steps for compiling these specifications are as under:

- ❖ Determine Outputs
- ❖ Determine Inputs, database, methods, procedures & data communications to be employed.

The **Output-to-input** process is recommended since outputs are related directly to the objectives of the organisation.

Que. Discuss some of the System Development Tools widely used by System analysts.

Ans. Use of System Development Tools: These tools help the system analyst to :

- improve current info system & to develop new info system.
- Analyze present business operations, mgt. decision-making & info processing activities of the organisation.
- Propose & design new or improved info systems to solve business problems.

Types/Categories of System Development Tools:

1. **System Components & Flows:** These tools help the system analysts to document the data flow among the major resources & activities of an info system. Tools used under this category are:

(i) **System Flowcharts:** It is a graphic technique used to represent the inputs, outputs & processes of a business in a pictorial form. Under this technique, a chart is prepared to represent an algorithm or process showing the steps as boxes of various kinds & their order by connecting these with arrows.

(ii) **Data Flow Diagrams:** A DFD uses a few simple symbols to illustrate the flow of data among external entities. A DFD is composed of four basic elements, that are:

Symbol	Name	Explanation
	Data sources & destination	Sending data to/from the system is represented by square boxes called data sources or data sinks.
	Data flows	The flow of data into or out of a process is represented by curved or straight lines with arrows.
	Transformation process	The processes that transform data from inputs to outputs are represented by circles, often called Bubbles.
	Data stores	The storage of data is represented by two horizontal lines.

(iii) **System Components Matrix:** It provides a matrix framework to document the resources used, the activities performed & the info produced by the info system. It highlights how the basic activities of input, processing, storage, output & controls are accomplished in an info system and how the use of hardware, software & people resources can convert data resources into info products.

2. **User Interface:** Designing the interface between end-user & the computer system is a major consideration of a system analyst while designing the new system. Tools under this are:

(i) **Layout forms & screens:** This tool helps to design user interface and provides a layout base to design input forms & output reports. This tool is also known as **Report Generator** or **Form Generator**.

(ii) **Dialogue flow diagram:** It helps to analyze the flow of dialogue b/w user & the computer.

3. **Data Attributes & Relationships:** These tools help to define, catalogue & design the data resources in the info system. Tools under this are:

(i) **Data Dictionary: {May 2012}** It is a computer file that contains descriptive info about the data items in the files of a business info system. This info may include the following:

- **Identity of source documents** - that are used to create the data items.
- **Names of computer files** - that store the data items.
- **Names of computer programs** - that modify the data items.
- **Identity of computer programs or individuals** - who are permitted/not permitted to access the data items for the purpose of file maintenance, upkeep or inquiry.
- **Additions/Deletions to the record structure** - When the new data fields are added to the structure of a business file, then the info about each new data item is used to create a new computer record in the data dictionary. When the data fields are deleted from the structure of file records then their corresponding records are dropped from the data dictionary.

Use of Data Dictionary for Accountants & Auditors:

- ❖ When an Accountant participates in the design of a new system, he can use the data dictionary to plan the flow of transaction data through the system.
- ❖ An Auditor can use the data dictionary to establish an audit trail because it can identify the input sources of data items, the computer programs that modify particular data items & the managerial reports on which the outputs are based.

- (ii) **Entity-Relationship Diagram:** It documents the no. & type of relationship among the entities in a system.
- (iii) **File Layout Forms:** It documents the type, size & names of the data element in a system.
- (iv) **Grid Charts:** It helps in identifying the use of each type of data element in Input/Output or Storage media of a system.
4. **Detailed System Process:** These tools are used to help the programmer to develop detailed procedures & processes required in the design of a computer program. Tools under this are:
- (i) **Decision Trees:** It is commonly used in operations research (O.R) as a tool to identify most appropriate strategy which will help to achieve goals under different conditions. It is a tree-like graph which provides sequence of decisions with possible consequences.
- (ii) **Decision Tables:** It is a table which may accompany a flowchart defining the contingencies within a program & appropriate course of action for each contingency. It defines a logical procedure by means of a set of conditions & the related actions.
- Parts of a Decision Table:**
- **Condition Stub:** It lists out the conditions or comparisons that could exist in a program.
 - **Action Stub:** It lists statements that describe all the actions that can be taken.
 - **Condition Entries:** It indicates which conditions are being met or answer the questions in the condition stub and also describes which factors are actually the components of a decision.
 - **Action Entries:** It specifies the actions to be taken & defines the actual results of the decision.
- (iii) **Structure Charts:** It documents the purpose, structure & hierarchical relationships of the modules in a program.

Que. Short notes on -

Structured English or Pseudo Code	CASE Tools
(i) It refers to the use of english language with the syntax of structured programming. (ii) It aims at getting the benefits of both the programming logic & natural language. (iii) Programming logic helps to attain precision and (iv) Natural language helps in getting the convenience of spoken languages.	(i) CASE stands for Computer-Aided-Software-Engineering. (ii) It refers to the automation of anything that humans do to develop systems & support virtually all phases of traditional system development process. (iii) Some of the features that various CASE products possess are : <i>Data Dictionary, Computer aided diagramming tools, word processing, screen & report generator, prototyping, project management, code generation; and Reverse Engineering.</i> (iv) On-screen drawing modules found in CASE software packages are commonly used by the users to generate Data Flow Diagram & System Flow Charts.

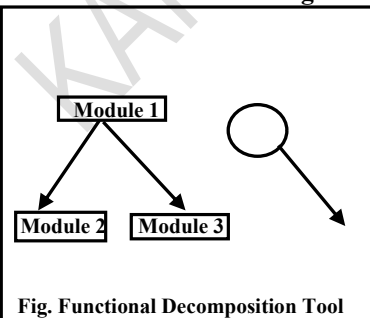
Que. At the end of Analysis Phase, the System Analyst prepares a document called “System Requirement Specifications (SRS)”. Write the contents of SRS.

Ans. A SRS contains the following:

- ◆ **Introduction:** It describes about the system to be developed with its goals & objectives.
- ◆ **Info Description:** It describes the info content required with flowcharts & structure and describes about hardware, software, human interfaces for external system elements & internal software functions.
- ◆ **Functional Description:** It describes about all the functions to be performed by the system in a diagrammatic representation with processing narrative for each function.
- ◆ **Behavioral Description:** It describes about the response to external events & internal controls.
- ◆ **Validation Criteria:** It describes about the classes of tests to be performed to validate functions; performance & constraints.
- ◆ **Appendix:** It provides the detailed description of algorithm charts, graphs, data flow/object diagrams, tabular data & other such material.
- ◆ **SRS Review:** It reflects the development team’s understanding of the existing processes and It contains the following:
 - * The development team makes a presentation & then hands over the SRS document to be reviewed by the user/ customer.
 - * The user should sign the document only after ensuring that the document represents the existing processing accurately as user’s sign on the document is a technical requirement of the contract b/w the users & the development team/organisation.

Que. Explain the various steps involved in the System Design phase.

Ans. 1. Architectural Design:



- (i) This design is made with the help of “**Functional Decomposition Tool**” which has three elements -
- * **Module** - It is represented by a box.
 - * **Connection** - The connection b/w modules is represented by arrows.
 - * **Couple** - It is a data element that moves from one module to another module & is shown by an arrow with circular tail.
- (ii) Architectural design deals with the organisation of applications in terms of hierarchy of modules & sub-modules. At this stage, system designers identify -
- ❖ Major modules
 - ❖ Function & scope of each module
 - ❖ Interface features of each module
 - ❖ Direct & indirect linked module etc.

2. Design of Data/Info Flow: This is the major step in the conceptual design of new system. In designing the data/info flow for the proposed system, the inputs required are - (i) Existing data/info flows (ii) Problems with the present system and (iii) The Objectives of new system.

3. Design of Database: It involves determining its scope ranging from local to global structure. The design of database involves four major activities which are discussed below: {May 2012}

Design Activity	Explanation
Conceptual Modeling	This activity describes (i) The application domain via entities/objects (ii) Attributes of these entities/objects and (iii) Static & Dynamic constraints on these entities/objects, their attributes & their relationships.
Data Modeling	Under this activity, conceptual models are translated into data models so that they can be accessed & manipulated by both high level & low level programming languages.
Storage Structure Design	In this activity, decisions are taken on how to partition the data structure so that it can be stored on some device.
Physical Layout Design	In this activity, decisions are taken on how to distribute the storage structure across specific storage media & locations.

4. Design of User-interface: It involves determining the ways in which the users will interact with the system. The points that need to be considered while designing the user-interface are :

- (i) Source Documents - to capture the raw data
- (ii) Hard copy output reports
- (iii) Screen Layouts - for dedicated source-document input
- (iv) Inquiry Screens - For database interrogation
- (v) Graphic & color displays etc.

5. Physical Design: (i) For the physical design, the logical design is transformed into units which in turn can be further decomposed into implementation units such as programs & modules.

(ii) During physical design, the primary concern of the auditor is effectiveness & efficiency issues.

(iii) Some of the issues addressed here are -

- a) Type of hardware - for client application & server application
- b) Operating system to be used
- c) Type of networking
- d) Processing - batch, online, real time
- e) Frequency of input, output

6. Design of the Hardware/system Software platform: (i) If the hardware/system software required by new system is not currently available in an organisation, then, such hardware/system software platform will have to be designed.

For example: A DSS might require high-quality graphics which may not be supported by the existing hardware & software.

(ii) If different hardware & software are not able to communicate with each other then subsequent changes will have to be made to make the hardware & software compatible to each other.

Que. List the important factors to be considered by the System Analysts while designing user input/output forms.

Ans.

Aspect	Definition	Input Design	Output Design
Content	It refers to actual pieces of data to be gathered to produce the required user output.	The Analyst should gather required data to generate desired user output. He may design new documents for collecting such info.	Example - Weekly report to a sales manager might consist of salesmen's name, sales calls made & product sold etc.
Timeliness	It refers to when users need output on regular/periodic basis like weekly, monthly, quarterly or annually.	Computer needs input data in time to produce output data. So, a plan must be established regarding when different types of data will enter into the system.	Example - (i) A sales manager may require a weekly sales report. (ii) Airline agents require both real-time info & rapid response times in order to provide better client service.
Format	(i) Input format refers to physical arrangement of data. (ii) Output format refers to the way in which the contents are displayed on output media.	Output contents & media requirements are decided first, then input formats are designed on the basis of factors like - a) Type & length of each data field b) Other special characteristics like no., decimal places etc.	Output formats like info reports should assist in decision-making, identifying & solving problems and initiate corrective action.
Media	It refers to physical device used for I/O & Storage.	Various user input alternatives may include display workstations, keyboards, optical character recognition, voice input etc.	Output media may include Paper, Video display, Microfilm, Magnetic Tape/Disk and Voice Output.
Form	(i) Input Form is the way, the info is inputted and (ii) Output Form is the way, the info is presented to the users.	Input forms serve as source documents for the data entry personnel. Example - Pre-printed papers - that require the people to fill in responses in a standardized way.	Output forms should be decided based on user requirements. Example - Managers may require detailed info on some issues & summary info in other areas.

Que. Mgt. should establish acquisition standards that address the same security & reliability as development standards. What should be the focusing areas of acquisition standards? {RTP May 2013}

Ans. After a system is designed either partially or fully, the next phase of the system development starts which relates to the acquisition of hardware, software & services. Mgt. should establish acquisition standards that address the same security & reliability as development standards. **Acquisition standards should focus on -**

- Ensuring that the security, reliability & functionality has already built into the product.
- Ensuring that the managers are entered into the contracts with appropriate vendors, have reviewed licensing and have acquired the products that are compatible with the existing systems.
- **Invitations-to-tender** (since these involve soliciting bids from vendors when acquiring hardware or integrated systems of hardware & software)
- **Request-for-proposals** (since these involve soliciting bids when acquiring off-the-shelf or third-party developed software)
- Ensuring that the functional, security & operational requirements are accurately identified & clearly detailed in the request-for-proposals.

Que. Write short notes on Hardware Acquisition in the context of System Acquisition.

Ans. Hardware Acquisition: Procuring hardware is not an easy task due to rapid changes in technologies of hardware & software applications. It also requires a continuous support from vendors in terms of service & compatibilities with changing hardware technologies & software applications. **The following points should be considered before finalizing the computer hardware:**

1. The selection of hardware should be based on system design & technology selected that should satisfies the data processing requirements.
2. Hardware should be selected of latest technology.
3. Hardware should be procured to support the required inputs & output devices and can handle required type of data volume.
4. Hardware purchased should be easily expandable & upgradable in future for increased processing requirements.
5. There should be required support from hardware vendor both for operational as well as for technical requirements.

Que. Write short notes on Software Acquisition in the context of System Acquisition.

Ans. After the input & output designs are finalized, the system analyst must understand the nature of application software requirements. At this stage, the system developers should determine whether the application software should be developed in-house or it should be acquired from the vendor. Buy decision for software should depends upon the following factors:

1. Required software is available in the market.
2. Time required to develop new software is not available with the mgt.
3. Cost of developing software is very high.
4. Skills required to develop software is either not available or available but very expensive.

Que. Write short notes on Contracts, Software licenses & Copyright violations, in the context of Software Acquisition.

- Ans.** (i) Contracts b/w an organisation & software vendor should clearly describe the rights & responsibilities of the parties to the contract. The contracts should be in writing with sufficient detail to provide assurances for performance, software & data security etc.
- (ii) Software license grants permission to do things with computer software that are otherwise prohibited by copyright law, patent law, trademark law and any other intellectual property right.
- (iii) Copyright laws protect proprietary as well as open-source software. The use of unlicensed software or violations of a licensing agreement expose organizations to possible litigations.

Que. List the factors to be considered for evaluation & selection of vendor's proposals.

{May 2006}

Ans. Following factors should be considered for evaluation & selection of vendor's proposals:

- (i) The Compatibility of each proposed system with the existing system;
- (ii) The Performance capability of each proposed system in relation to its cost;
- (iii) The Costs & Benefits of each proposed system;
- (iv) The Maintainability of each proposed system ; and
- (v) The Vendor's support.

Que. Describe in brief, the methods of validating vendor's proposals.

Ans. (i) Checklists:

An example of Support Service Checklist is given below:

In this method,a list is prepared for required specifications from system in terms of hardware, software & support services etc and the proposals are selected on the basis of this list.

An Example of Point Scoring Analysis List is given below:

In this method,every evaluation criteria is given maximum possible points and then the points are allocated to each vendor for these criteria as per the submitted details in their proposals.The vendor who satisfies the given criteria is selected for acquiring system.

Parameters	Vendor 1 (Dell)	Vendor 2 (IBM)	Vendor 3 (HP)
Performance	Excellent	Very Good	Good
Training Support	Provided	Provided	Provided
Back-up	Provided	Provided	Provided
Hardware	Excellent	Moderate	Good
Software	Excellent	Excellent	Good

Software Evaluation Criteria	Possible Points	Vendor A	Vendor B	Vendor C
Does the software meets all the mandatory specifications?	10	7	9	6
Does the software contain adequate controls?	10	9	9	8

Does the software have an adequate warranty?	8	6	7	6
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- (iii) **Public Evaluation Reports:** Several consultancy agencies compare & contrast the hardware & software performance for various manufacturers & publish their reports in this regard. This method is useful where the buying staff has inadequate knowledge of facts.
- (iv) **Bench marking problem for vendor's proposals:** This is a practical approach for testing whether the computer offered by the vendor meets the requirements of the job on the hand of buyer. In this approach, a job mix of possible transactions to be executed on the required system is prepared & then the same is executed on the vendor's proposed system. Proposal will be accepted if the proposed system meets the requirements.
- (v) **Test Problems;** In this approach, the test problems on certain issues (like the Time required to translate the source code into the object code, Response time for two or more jobs in multi-programming environment, Time required to execute an instruction etc) are developed and their relative weight age are assigned. Based on these test problems, the results achieved by the machine are compared & the price performance judgment can be made.

Que. What are the features of a Good Coded Program?

RTP Nov 2012, Nov 2012, RTP Nov 2013

Ans. A good coded program should have the following characteristics:

1. **Accuracy:** It refers not only to what a program is supposed to do but should also take care of what it should not do. The second part becomes more challenging for quality control personnel & auditors.
2. **Efficiency:** It refers to the performance which should not be unduly affected with the increase in input values.
3. **Reliability:** It refers to the consistency which a program provides over a period of time. However, poor setting of parameters & hard coding could result in failure of a program after some time.
4. **Usability:** It refers to a user-friendly interface & easy-to-understand document for any program.
5. **Readability:** It refers to the ease of maintenance of a program even in the absence of a program developer.
6. **Robustness:** It refers to the process of taking into account all possible inputs & outputs of a program in case of least likely situations.

Que. Explain in brief the various Steps/Stages/Activities involved in System Development Phase of SDLC.

Ans. 1. Program Coding Standards: These standards are set of rules that serve as a method of communication b/w teams, amongst team members & users. Different programmers may write a program using different sets of instructions but each giving the same results. These standards provide the following benefits :

- They minimize the system development setbacks (i.e delays or obstacles) due to programmer turnover.
 - They provide simplicity, ensure efficient utilization of storage & take least processing time.
2. **Programming Language:** These are the set of instructions or program codes that are used by the system developers in writing software, statements or instructions which are then converted to binary by using compiler so that the computer can understand & execute the required instructions. The choice of programming language depends upon the application area; algorithm complexity; environment in which the software has to be executed; and the capability of in-house staff for maintenance etc. The most commonly used programming languages are as follows :
- High-level general purpose programming language such as COBOL and C language.
 - Object-oriented languages such as C++, JAVA etc.
 - Scripting language like JAVA Script, VB Script.
 - Decision Support or Expert System languages like PROLOG.
3. **Program Debugging:** It is the most primitive (i.e earliest) form of testing activity which refers to correcting programming language syntax & diagnostic errors so that the program compiles cleanly. Steps involved in program debugging are as follows:
- Inputting the source program to the compiler,
 - Letting the compiler find errors in the program,
 - Correcting the lines of code that are erroneous and
 - Re-submitting the corrected source program as input to the compiler.

Eg. On writing the I.put, the compiler will correct it & re-submit it as Input.

4. **Program Testing:** In this step, the programmer plans the testing to be performed on each program so as to assess the success of installation of a system. The program test plan should be discussed with the project manager & the system users. A log should be kept for test results & conditions that are successfully tested.
5. **Program Documentation:** The writing of narrative procedures & instructions is done throughout the program life cycle. Managers & system users should carefully review the documentation in order to ensure that the software & the system behave in the same manner as the documentation indicates. If they do not, the documentation should be revised.
6. **Program Maintenance:** The continual changing requirements of data processing applications require modification of various programs. Such modifications are generally done by maintenance programmers.

Que. Explain in detail the different levels of testing during System Testing phase of SDLC.

Ans. Different levels of Testing are as follows:

1. **Unit Testing:** (i) A unit is the smallest testable part of an application which may be an individual program, function, procedure etc or may belong to a base/super class, abstract class or derived/child class. (ii) A unit test provides a strict written contract that the piece of code must satisfy. (iii) Unit tests are typically written & run by the system developers to ensure that the code meets its design &

behaves as intended.(iv) In Computer programming,unit testing is a software verification & validation method,in which a programmer tests whether the individual units of source code are fit for use.(v) The goal of unit testing is to isolate each part of the program & show that the individual parts are correct.

Various Categories of tests that a programmer should typically perform on a program unit

{RTP May 2013}

OR

Method to test the correctness of particular module of source code

{Nov 2010}

OR

The Areas/Aspects of tests that can be performed on a Program Unit

{May 2010}

(i) **Functional Tests:** These tests check whether programs do what they are supposed to do or not. The test plan specifies the operating conditions, input values & expected results, and the programmer checks by inputting the values to see whether the actual results & expected results match.

(ii) **Performance Tests:** Such tests should be designed to verify the response time, execution time, primary & secondary memory utilization and the traffic rates on data channels & communication links.

(iii) **Stress Tests:** Such tests are used to determine the stability of a given system or entity. It involves testing beyond normal operational capacity in order to overload a program for the purpose of determining the limitations of the program.

(iv) **Structural Tests:** These tests are concerned with examining the internal processing logic of a software system.

(v) **Parallel Tests:** In these tests, the same test data is used in the new system & old system in order to compare the output results.

Types of Unit Testing

(i) **Static Analysis Testing:** It does not involve any code execution. Some important static analysis tests are as follows:

a) **Desk Check:** This is done by the programmer himself. He checks for logical syntax errors & deviation from coding standards.

b) **Structured Walk-Through:** Under this, the application developer leads other programmers through the text of program & explanation.

c) **Code Inspection:** Under this, the program is reviewed with formal checklists by a formal committee.

(ii) **Dynamic Analysis Testing :**

RTP Nov 2013

It involves actual testing of program with test data. Some important tests performed under this are as follows:

a) **Black Box Testing: (Nov 2009)** It takes an external perspective of test object to derive the test cases. These tests can be functional or non-functional. The test designer selects valid & invalid inputs to determine the correct output. There is no knowledge of test object's internal structure.

This method is applicable to Unit testing, System testing, and Acceptance testing. The higher the level of testing, the bigger & more complex will be the box. If a module performs a function which is not supposed to, the black box test does not identify it.

b) **White Box Testing:** It uses an internal perspective of the system to design test cases based on internal structure. It requires programming skills to identify all paths through the software. Since, the tests are based on actual implementation, if the implementation changes, the tests will also probably change.

This method is applicable at Unit, Integration, and System levels of testing process. While it normally tests paths within a unit, it can also test paths b/w units during integration and b/w sub-systems during a system level test.

c) **Gray Box Testing:** This technique uses a combination of black box testing & white box testing. Under this technique, the test designer uses the white box approach to apply a limited no. of test cases to the internal workings of the software under test and in the remaining part, he uses the black box approach in applying inputs to the software under test & observing the outputs.

2. **Integration Testing:** This testing is done after unit testing but before system testing. Under this testing, individual software modules are combined & tested as a group with an objective to evaluate the connection of two or more components that pass info from one area to another.

Types of Integration Testing

RTP May 2012

(i) **Bottom-up Integration:** It is the traditional strategy used to integrate the components of a software system into a functioning whole. It consists of unit testing, followed by sub-system testing, and then testing of the entire system.

Advantage: Easy to implement.

Disadvantage: Major decision is deferred to a later period.

(ii) **Top-down Integration:** It starts with testing of main module & after completing its testing, stubs are substituted with real modules one by one and then these modules are tested with stubs.

Advantage: It emphasizes on major control decision points encountered in the earlier stages of a process and detects any error in these processes.

Disadvantage: Difficulties may arise because the high level modules are tested with outputs from stubs but not with the real outputs from subordinate modules.

(iii) **Regression Testing (Nov 2010) :** This testing is done when new modules are added to the existing modules, since each time a module is added as part of integration testing, the software changes. These changes may cause problems with functions that were previously worked perfectly. Regression tests ensure that changes or corrections have not introduced any new errors. The data used for regression tests should be the same as it was used in the original test.

3. **System Testing:** It is a process in which software & other system elements are tested as a whole. System testing begins either when the software as a whole is operational or when the well defined subsets of the software's functionality have been implemented.

Purpose of System Testing - It ensures that the new or modified system functions properly.

Types of System Testing

RTP May 2012

- (i) **Recovery Testing:** This testing is performed to determine the ability of application to recover from the crashes, hardware failures & other similar problems.
- (ii) **Security Testing:** This testing is performed to determine the ability of info system to protect the data & maintain functionality as intended. Security testing must cover the following six concepts of security :
- (a) Confidentiality, (b) Integrity, (c) Availability, (d) Authentication, (e) Authorization, and (vi) Non-Repudiation.
- (iii) **Stress or Volume Testing:** This testing is performed to determine the stability of a given system. It involves testing beyond the normal operational capacity, often to a breaking point.
- (iv) **Performance Testing:** This testing is performed to determine the speed or effectiveness of a computer, network, software program or device.
- 4. Final Acceptance Testing:** This testing is conducted when the system is just ready for implementation. This testing ensures that the quality standards adopted by the business & the system satisfies the users.

Types of Final Acceptance Testing

- (i) **Quality Assurance Testing:** It ensures that the new system satisfies the prescribed quality standards and the development process is as per the organization's quality assurance methodology,
- (ii) **User Acceptance Testing:** It ensures that the functional aspects expected by the users have been well addressed in the new system. There are two types of user acceptance testing:
- a) **Alpha Testing:** This is the first stage, often performed by the users within the organization.
- b) **Beta Testing:** This is the second & last stage, generally performed by the external users after which the product is normally sent outside the development environment for real world exposure.

Que. Describe the various Activities/Steps to be taken for the successful installation of Equipment during the System Implementation Phase of SDLC.

Ans. 1. Equipment Installation: The Hardware selected prior to the implementation phase to support the new system should be ordered in time so that the installation & testing of equipment could be made during implementation phase. Following steps are involved in equipment installation:

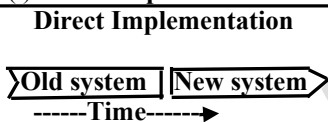
- (i) **Site Preparation** - First of all, a site layout is prepared for users sitting arrangement, wiring arrangement, and for equipment setting etc. after thoroughly considering all the parameters like Temperature, Humidity & Dust control etc.
- (ii) **Installation of new hardware/software** - The equipment must be physically installed by the manufacturer, connected to the power source and wired to the communication lines. If the new system interfaces with other systems or is distributed across multiple software platforms, then, some final commissioning tests of the production environment should be performed to check end-to-end connectivity.
- (iii) **Equipment Check out** - To ensure proper working of equipment, it must be turned on and some extensive tests must be run on it.

2. Training Personnel: A system can succeed or fail depending on the way it is operated & used. That is why, when a new system is acquired, both users & computer professionals generally require some type of training. Therefore, the quality of training received by personnel helps or hinders the successful implementation of info system.

3. System implementation Conversion Strategies: Conversion or changeover is a process of changing from the old (manual) system to the new (Computerized) system.

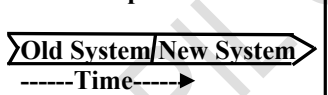
Types of Implementation Strategies

(i) Direct implementation/Abrupt changeover -



In this method, the old system is completely discontinued and the new system is put into use on a given date often after a break in production or on a holiday so that the time can be used to install the hardware & software without any disruption.

(ii) Phased Implementation -



In this approach, New System is developed in phases. If each phase is successful then the next phase is started and eventually leading to the final phase when the new system fully replaces the old system.
For example - In phase 1, A/cs & inventory module is implemented and in phase 2, Sales & marketing module is implemented and this continues until the entire system is implemented.

Difference between Phased Implementation & Pilot Implementation.

RTP Nov 2012

(iii) Pilot Implementation -

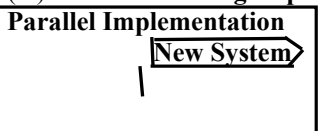


This approach is used when the same system is to be installed at several places. If the conversion of a system on one place is done successfully then the same system can be implemented at all other places.

Advantage - Problems detected in the initial installation can be avoided/removed in subsequent installations.

Disadvantage - Successful conversion on one site may not work at other sites due to diff. Requirements.

(iv) Parallel Running Implementation -



This is considered the most secure method with both systems running in parallel over an introductory period. If all goes well, the old system is stopped and new system carries on as the only system.

Old System

-----Time----->

Advantage - The user can compare the results of new system with the old system.

Disadvantage - Duplication of work & efforts.

Que. Explain the major Conversion Activities involved in Conversion Procedure.

{Nov 2010}

Ans. 1. Procedure Conversion - Operating procedures should be clearly documented to assist the personnel in their functional areas. Info on input, data files, methods, procedures, output, and internal controls must be presented in clear, concise & understandable terms. Written procedures must be supplemented by oral communication during the training session on the system change.

2. File Conversion - In this activity, the old data files are converted as per the new system requirements. It is done before the implementation of new system to make the old files compatible for new system. Old files should also be kept for some time because if any bug is detected later in the conversion routine, the same can be rectified.

3. System Conversion - After on-line & off-line files have been converted and the reliability of new system has been confirmed, the routine processing can be shifted to the new system. Old system should also be operated on for some time to compare the results of both the systems.

4. Scheduling Personnel & Equipment - For the maximum utilization of new system, the personnel & equipment must be scheduled by the system manager in conjunction with IT & departmental managers. Jobs should be allocated as per the equipment scheduling.

Que. Write short notes on Post Implementation Review and Evaluation.

{RTP Nov 2004}

Ans. PIR Meaning: PIR should be done after the solution has been deployed. It examines the effectiveness of all elements of the working business solution to see whether further improvements can be made to optimize the benefit delivered.

Purposes of PIR: PIR should be done - (i) To ascertain the degree of success from the project (ii) To deliver planned levels of benefit and (iii) To address the specific requirements as originally defined.

Aspects of Evaluation:

There are two basic dimensions of info system that should be evaluated, these are :

(i) Whether the newly developed system is operating properly? And

(ii) Whether the user is satisfied with the info system with regard to the reports supplied by it?

Types of Evaluation:

1. Development Evaluation - This evaluation is done to check whether the system has been developed on schedule & within budget. It requires schedules & budgets to be established in advance. If the system is not developed on schedule & within budget, then the possible reasons for delay & over cost etc are noticed & identified as evaluation remarks.

2. Operation Evaluation - This evaluation pertains to check whether the hardware, software & personnel are capable to perform their duties. It requires evaluation criteria to be established in advance.

For Example: If the system analyst has laid down a criteria that a system which is capable to support 100 terminals should give response time of less than 2 seconds, then the evaluation of this aspect of system operation can be done easily when the system becomes operational.

3. Information Evaluation - This evaluation pertains to evaluate the info provided by the info system. Since the objective of an info system is to provide info to support the organizational decision system, therefore, the extent to which the info system is supportive to decision making is the area of concern in evaluating the system. This aspect of system evaluation is however a difficult task & it cannot be conducted in a quantitative manner.

Que. Write short notes on Info System Maintenance. What are the different types of maintenance?

Nov 2008, 2010, 2011

Ans. Most info systems require some modification after development due to failure to anticipate all requirements during system design and changing organizational requirements. The process of enhancing the existing system according to the changed requirements is called system maintenance.

Types of System Maintenance

1. Scheduled Maintenance - It can be anticipated & planned for.

Example - Implementation of new inventory coding scheme can be planned in advance.

2. Rescue Maintenance - It refers to previously undetected errors that were not anticipated but require immediate solution.

3. Corrective Maintenance - It deals with fixing bugs in the code or defects found. The need for corrective maintenance is usually initiated by bug reports drawn up by the end users.

Example - (i) Correcting a failure to test for all possible conditions or

(ii) Correcting a failure to process the last record in a file.

4. Adaptive Maintenance - It consists of adapting software to changes in the environment, such as Hardware or Operating System. The need for adaptive maintenance can only be recognised by monitoring the environment.

5. Perfective Maintenance - (i) It mainly deals with accommodating to new or changed user requirements and

(ii) concerns functional enhancements to the system & activities to increase the system's performance or to enhance its user interface.

6. Preventive Maintenance - The long term effect of corrective, adaptive & perfective changes and continuous changes in program increases the system's complexity, which is required to be reduced. The process by which, system's complexity is reduced is called preventive maintenance.

Que. Write short notes on Operation Manual.

Ans. It refers to a user's guide or a technical communication document intended to give assistance to system users. It is usually written by a technical writer who may be programmers, project managers or other technical staff. These are most commonly associated with electronic goods, computer hardware & software.

Operation manual includes the following:

- i. Cover page, Title page and Copyright page;
- ii. Preface - containing details of related documents & info on how to navigate the user guide;
- iii. Contents page;
- iv. Guide on how to use at least the main functions of the system;
- v. Troubleshooting section - detailing possible errors or problems that may occur, along with how to fix them;
- vi. FAQs (Frequently asked questions) ;
- vii. Where to find further help & contact details;
- viii. Glossary & Index (for larger documents).

Que. Write short notes on System Development Team. Also explain their roles involved in SDLC.

{Nov 2011}

Ans. People responsible for system development & their roles in SDLC are typically explained below:

1. **Steering Committee** - This committee consists of a group of key info system service users that acts as a review body for info system plans & applications development

Role: (i) Responsible for all costs & timetables (ii) Provide directions & ensures appropriate representation of affected parties.

(iii) Conducting regular review of progress of the project. (iv) Taking corrective actions like re-scheduling, re-staffing, re-designing etc.

2. **Project Manager** - A project manager is normally responsible for :

(i) Delivery of project within time & budget (ii) Periodical reviews of project's progress with the project leader & his team.

(iii) Liaisons (means communication & co-operation) with the client.

3. **Project Leader** - He is responsible for completion of a project & fulfillment of objectives. He reviews the project's progress more frequently than the project manager and the entire project team reports to him.

4. **System Analyst/Business Analyst** - His main responsibility is to conduct interviews with users & understand their requirements. He is a link b/w users & programmers who converts the user requirements in the system requirements and plays an important role in the requirement analysis & design phase.

5. **Module Leader/Team Leader** - Since a project is divided into several manageable modules, so the development responsibility for each module is assigned to module leaders. They are responsible for delivery of tested modules within stipulated time & cost.

6. **Programmer/Coder/Developer** - He is responsible to convert design into programs using programming language. He also tested the program for debugging activity.

7. **Database Administrator (DBA)** - The DBA handles multiple projects; ensures the integrity & security of info stored in database and also helps the application development team in database performance issues.

8. **Tester** - He is a junior level quality assurance personnel attached to a project who tests programs & sub-programs as per the plan given by the module/project leaders and prepares test reports.

9. **Domain Specialist** - He helps the project team to develop applications in new fields. **For example:** If a project team undertakes application development in insurance, about which they have only a little knowledge, they may seek the assistance of an insurance expert at different stages.

10. **IS Auditor** - He ensures that the application development also focuses on the control perspective. He should be involved at Design Phase & final Testing Phase to ensure the existence & operations of the controls in new software.

11. **Accountant** - An Accountant has knowledge in IT, Business, Accounting, Internal Controls, Behavior & communications etc that can be applied in development efforts. In addition, he can also perform Economic Feasibility/Cost-Benefit analysis to choose an optimum solution.

Que. Explain the objectives of "Audit of Systems under development" in the context of SDLC.

Ans. The audit of systems under development can have three main objectives:

1. To provide an opinion on the Efficiency, Effectiveness, and Economy of project mgt.
2. To assess the extent to which the system being developed provides for adequate audit trails & controls to ensure the integrity of data processed & stored; and
3. To assess the controls being provided for the management of the system's operation.

1. Define ERP.

An ERP system is a fully integrated business mgt system covering functional areas of an enterprise like Logistics, production, finance, Accounting & human resources. It organizes & integrates operation processes & info flows to make optimum use of resources such as men, material, money & machine. ERP is a global, tightly integrated closed loop business solution package and is multifaceted. ERP promises one database, one application and one user-interface for the entire enterprise.

2. Bring out the Evolution of ERP.

May 2002

ERP is evolved through improvements in other IS. Improvements in other IS are required due to following reasons:

- Aggressive cost control initiatives
- Need to analyze costs/revenues on a product or customer basis
- Flexibility to respond to changing business requirements
- More informed mgt decision-making
- Changes in ways of doing business.

These improvement requirements in IS has given different types of IS over the years. They are:

- Management Info system (MIS)
- Material Resource Planning (MRP)
- Manufacturing Resource Planning (MRP II)
- Money Resource Planning (MRP III)
- Integrated Info system (IIS)
- Executive Info system (EIS)
- Enterprise-wide Info System (EWS)
- Corporate Info system (CIS)

ERP has evolved from the system known as MRP II with the integration of info b/w vendor, customer & manufacturer using networks such as LAN, WAN and INTERNET etc. MRP II is a method of planning of all the resources of the mfg co. It involves all operational & financial planning and has simulation capabilities to answer "WHAT IF" questions. However, MRP II has a no. of drawbacks. The main problem is that it has not been able to effectively integrate the different functional areas to share the resources effectively.

The major drawback of MRP II gave rise to ERP system. ERP system provides an integrated info storehouse where info needs to be stored only once and can be further processed & reported to anyone in the value chain. ERP brings together in one platform different business functions, procedures, ideologies etc to make business functions more effective.

3. Outline the Technology required for ERP Or Describe how enabling technology helps in ERP Evolution.

It is not possible to think of an ERP system without sophisticated IT infrastructure. It is said that the earlier ERP systems were built only to work with huge mainframe computers. The new Era of PC, Advent of Client-Server technology and Relational DBMS, all have contributed for the ease of deployment of ERP systems. ERP uses the latest technologies available in the market to provide most efficient IS. The most important technology which enables ERP system to work efficiently is the Client-Server technology.

Client-Server Technology [Nov 2011] - Most of the ERP systems exploit the power of Three-tier Client-Server Architecture. In a client-server environment, data is stored on back-end database server and application logic/business rules are stored on middle ware and presentation for data entry & outputs is kept at client workstation.

ERP uses many other technologies for an integrated & efficient IS. **For Example** - Data Mining, Data Warehousing, Work-group flow, Internet, Intranet and EDI etc.

4. Any system has to possess few Characteristics to qualify for a true ERP solution. What are they?

Nov 2008; Nov 2012; RTP Nov 2013

An ERP system is not only the integration of various organization processes. Any system has to possess few characteristics to qualify for a true ERP solution. These features are:

(i) Flexible - ERP system should cover different languages, currencies & accounting standards etc and it should be flexible to respond to the changing needs of an organization. The client-server technology enables ERP to run across various database back ends through open database connectivity (ODBC).

(ii) Modular & Open - ERP system has to have open system architecture i.e. it implies that any module can be interfaced or detached, whenever required, without affecting the other modules. It should support multiple hardware platforms for the companies having heterogeneous collection of systems. It must support some third party add-ons also.

(iii) Comprehensive i.e. it should be able to support variety of organizational functions & must be suitable for a wide range of business organizations.

(iv) Beyond the Company i.e. it should not be confined to the organizational boundaries rather it should also support online connectivity to other business entities of the organization.

(v) Best Business Practices i.e. it must have a collection of the best business processes applicable worldwide.

5. What are the Features of an ERP?

Nov 2009

Will you suggest ERP solution to overcome the problems? If yes, explain why?

Nov 2011

Following are the reasons for ERP implementation:

(i) ERP provides Multi-platform, **Multi-facility**, Multi-code mfg, Multi-currency & Multi-lingual facilities.

(ii) It has **End-To-End Supply Chain Mgt (SCM)** to optimize the overall demand & supply of data.

- (iii) It facilitates **Organization-wide integrated info system** covering all functional areas like production, marketing, finance and accounting & human resources.
- (iv) It bridges the info gap **across organizations**.
- (v) It provides complete integration of systems not only across departments but also **across companies** under the same mgt.
- (vi) It allows **automatic introduction of latest technologies** like EFT, EDI, and E-Commerce etc.
- (vii) It **provides intelligent business tools** like DSS, EIS to enable better decision-making.
- (viii) It **eliminates most of the business problems** like material shortages, quality mgt, cash mgt, inventory mgt etc.
- (ix) It performs core activities & increases customer services thereby **increasing corporate image**.

6. Describe the various business processes which can be integrated using ERP.

{Chapter 1 Que}

Nov 2013

Ans. 1. Business system: It includes

- (i) Business forecasting for product /mkt groups
- (ii) Target fixing & allocation by key parameters
- (iii) Strategy formulation & implementation
- (iv) Resource allocation to key result areas
- (v) Strategy monitoring & control
- (vi) Info-based mgt for mgt applications

2. Production: It includes

- (i) Production planning & control
- (ii) Purchasing & procurement system
- (iii) Inventory mgt
- (iv) Inventory analysis & valuation
- (v) Excise/Custom interface
- (vi) Production info systems for production applications

3. Maintenance: It includes

- (i) Plant maintenance planning
- (ii) Breakdown, preventive & conditional maintenance
- (iii) Monitoring performance of maintenance action
- (iv) Maintenance info systems for maintenance applications

4. Quality Control: It includes

- (i) Quality assessment against standards
- (ii) Quality assessment by process, material & work center location
- (iii) Analysis of quality by reasons & actions taken
- (iv) Quality control info systems for quality control applications

5. Marketing: It includes

- (i) Mkt/Product/Customer analysis
- (ii) Sales forecasting & Budgeting
- (iii) Mkt Research info
- (iv) Distribution & channel mgt
- (v) Order processing & analysis
- (vi) Marketing info systems for marketing applications

6. Finance: It includes

- (i) Financial planning & control
- (ii) Mgt of long-term funds & working capital mgt
- (iii) Ledgers, payables & receivables
- (iv) Finance info systems for finance applications

7. Why Companies undertake ERP? OR If you are the CEO of the company, what factors would be considered before undertaking implementation of ERP system?

May 2010

1. Integrate Financial Info: As the CEO tries to understand the company's overall performance, he may find many different versions of truth.

For Example - Finance has its own set of revenue numbers; Sales has another version; and the different business units may each have their own version of how much they contributed to revenue.

ERP creates a single version of truth that can not be questioned because everyone is using the same system.

2. Integrate Customer Order Info: By having the info in one software system rather than scattered in many different systems, companies can keep track of customers orders more easily, and coordinate manufacturing, inventory & shipping among many different locations simultaneously.

3. Standardize & speed up mfg processes: ERP systems come with standard methods for automating some of the steps of a mfg process. Standardizing those processes & using a single integrated system can save time, increase productivity & reduce headcount.

4. Reduce Inventory: ERP helps the mfg process flow smoothly & it improves the visibility of order fulfillment process inside the company, which can lead to reduced inventories of raw materials & finished products at the warehouses & shipping docks.

5. Standardize HR info: ERP provides a simple method for tracking employees' time & communicating with them about benefits & services.

8. What are the pre-requisites for (or challenges in) successful ERP implementation?

RTP Nov 2002

How will you get over the impediments for the successful implementation of ERP? Mention any five.

May 2010

ERP implementation is a risky effort since it involves considerable amount of time, efforts & valuable resources. Even with all these, the success of an organization is not guaranteed. Following are the pre-requisites for successful ERP implementation:

1. The success of an implementation mainly depends on how closely the implementation consultants, users & vendors work together to achieve the overall objectives of the organization. The implementation consultants have to understand the needs of users, understand the prevailing business realities & design the business solutions keeping in mind all these factors. It is the users who will be driving the implementation & therefore their active involvement at all stages of implementation is vital for overall success of implementation.
2. ERP is an enabling tool which makes one do his work better which naturally need additional efforts.
3. During the course of implementation, the standard package may undergo changes which may be simple one or a major 'functionality' change. The package should be expandable & adaptable to meet these changes.
4. Any change in one functional module will have an adverse impact on the functioning of the other modules of the package. Maximum benefit will be available only when the standard package is implemented in totality.
5. The roles & responsibilities of the employees have to be clearly identified, understood & configured in the system. The employees will have to accept new processes & procedures laid down in the ERP system.

6. The implemented ERP package must give a good return on investment.

9. What are the benefits of using ERP System?

{Chapter 1 Que}

Nov 2011

1. **Better use of Organizational Resources:** ERP enables an organization to make better use of its resources which are scarce by their nature. Making better use of these resources is possible because ERP offers a model which indicates where the resources find best usage & how resources can be managed to produce the best result. Thus, through the application of ERP, organizational resources are put at a place where they have their optimum utilization.

2. **Lower operating costs:** ERP results into lower operating costs to the organization. It is possible due to improved business performance through cycle time reduction, inventory reduction, order fulfillment improvement etc. Lower operating cost means improved profitability for the organization.

3. **Proactive decision-making:** A proactive decision-making process emphasis that decisions must be made in advance of likely environmental changes & anticipated competitive moves by competitors.

4. **Decentralized decision-making:** ERP enables an organization to decentralize its decision-making process. Thus, decisions are made at those points at which these are relevant for execution. Due to faster processing technology & SQL, managers can see the info in their own perspective. Further, with intelligent ERP downloads, decisions can be made even at lower mgt levels. Thereby, releasing the burden on higher mgt levels & freeing them for strategic thinking.

5. **Flexibility in business operations:** An organization has to design its business operations according to changing environmental needs. In order to take care of changing environmental needs, ERP provides flexibility in business operations because different languages, currencies, accounting standards etc can be covered in one system.

6. **Enhanced customer satisfaction:** To compete effectively in today's marketplace, organizations must focus on their customers. Customers have become increasingly aggressive in demanding quality & service because they have a wide range of choices. ERP provides the way for efficient & effective processing of customers' requests & emphasizing customer relationship mgt.

10. What are the limitations of ERP systems?

{Chapter 1 Que}

(i) An ERP system provides current status only But managers may also require past info to identify trends & patterns for better decision making.

(ii) The methods used in ERP applications are not integrated with other organizational or divisional systems. Further, they do not include external intelligence.

(iii) ERP systems may be too time consuming & costly for certain organizations.

11. What key planning & implementation decisions are taken for ERP implementation?

1. ERP or Not to ERP?

Decision to implement an ERP should be based on following factors:

(i) **Technology** i.e. (a) Need to integrate the functions of individual systems; (b) Replace poor-quality existing systems; and (c) merge acquisitions with new capabilities into the business environment.

(ii) **Process Improvements** i.e. actions that result in personnel & IT cost reductions.

(iii) **Productivity Improvements** i.e. (a) The need to close the financial cycle; and (b) Increase the overall production from an enterprise viewpoint.

(iv) **Strategic Considerations** i.e. (a) To implement new strategies not supported by the current software; (b) To improve customer service & satisfaction; and (c) To enhance customer responsiveness.

2. Follow Software's processes or Customize?

This key decision may determine the success or failure of the ERP effort.

Follow software's processes	Customization
Merits: If the organization decides to follow the process of software, this will result in the organization following best practices within its sector, thereby giving it a chance to improve & standardize their processes. This approach will also facilitate future change to the ERP software. Demerits: This approach can create significant turmoil (i.e. confusion/resistance/misunderstanding/disorder) by requiring the employees to change their ways of doing business.	Merits: If the organization decides to stick with its current processes & customize the software to fit these processes, the organization obviously will not have to experience the pain & stress associated with changing its process. Demerits: It will be very costly to customize & maintain the software over time. Interfaces modular compatibility needs to be sustained.

3. In-house or Outsource?

In-house	Outsource
Merits: (i) A better match b/w the software & the business; (ii) Applications optimized for the organization; and (iii) Better maintained security. Demerits: An in-house approach can't be accomplished if there is a lack of internal expertise & personnel to support such an effort.	Merits: It allows the organization to continue to focus on its core mission, avoid a relative substantial financial commitment & minimize the impact on the MIS department. Demerits: It provides opportunities to the external people to affect the employees' morale & give rise to security issues.

4. "Big Bang" or Phased Implementation?

Big Bang Implementation	Phased Implementation
It involves having all modules at all locations implemented at the same time.	In phased implementation, the modules are implemented in phases, often at a single location at a time.

Characteristics: (i) No need for temporary interfaces; (ii) Limited requirement to maintain legacy software; (iii) Cross-module functionality; and (iv) Low overall cost if no contingencies arise.	Benefits: (i) Smoothing of resource requirements; (ii) Ability to focus on a particular module; (iii) Availability of existing legacy systems as a fall-back; (iv) The knowledge gained with each phase & the usefulness of demonstrable working system.
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5. The wave approach: This approach involves the application of different waves of change to different business units or regions.

6. Parallel implementation: This approach involves both ERP & an existing system running together for a period of time.

Merits	Demerits
(i) This approach provides a basis of comparison. (ii) Existing system serves as backup.	(i) It requires more computing & human resources; so, it is costly. (ii) Existing system may not be properly maintained.

7. Instant cutovers (flip-the-switch):

Merits	Demerits
(i) This approach is lower in cost, so it motivates the users to seriously convert to the new system. (ii) This approach reduces the need for redundant systems.	This approach tends to be risky, stressful to users and requires a high level of contingency planning.

12. Explain the steps involved in implementation of a typical ERP package.

June 2009; RTP Nov 2012; RTP Nov 2013

Explain the ERP implementation Methodology

Several steps are involved in the implementation of a typical ERP package. These are:

(i) **Identifying the needs for implementing an ERP package:** Some of the basic questions to be answered are:

- Why should an ERP package be implemented?
- Will it improve profitability?
- How does it improve customer satisfaction?
- Will it help to reduce product-cost?
- How can it help to increase business turnover?

(ii) **Evaluating the 'As is' situation of the business** i.e. to understand the strength & weakness prevailing under the existing circumstances. For this purpose, the various functions should first be listed, which may:

- Total time taken by the business processes;
- No. Of decision points existing in the present scenario;
- No. Of departments/locations of business processes;
- The flow of info & its routing;
- The no. Of reporting points currently available.

(iii) **Deciding the 'Would be' situation for the business** i.e. the changes expected after the implementation of ERP. The concept of 'Benchmarking' is used to see that the processes achieved are the best in industry. Benchmarking is done on various factors like cost, quality, service etc.

(iv) **Re-engineering the business process:** This process is done to achieve the desired results in the existing processes by way of -

- Reducing the business process cycle time;
- Reducing the no. Of decision points to a minimum; and
- Making the flow of info more efficient & eliminating the unwanted flow of info.

(v) **Evaluating the various available ERP packages to assess suitability.** (Refer Q.No. 14)

(vi) **Finalizing the most suitable ERP package for implementation:** This is done by making a comparison of critical factors through a matrix analysis.

(vii) **Installing the required hardware & networks for the selected ERP package:** This work is carried out in a phased manner depending on the schedule of implementation & the need of hardware components.

(viii) **Finalizing the implementation consultants who will assist in implementation:** The factors of selection for consultants are:

- ✓ Skill set
- ✓ Industry specific experience
- ✓ Cost of hiring the consultant

(ix) **Implementing the ERP package:** The general steps involved in the implementation are:

- ✓ Formation of team
- ✓ Preparation of plan
- ✓ Mapping of business processes to package
- ✓ Gap analysis i.e. deviation of existing processes from standard processes
- ✓ Customization
- ✓ Uploading of data from existing system
- ✓ Test runs
- ✓ Parallel run
- ✓ User training
- ✓ Concurrence fro user
- ✓ Migration to new system
- ✓ User documentation

- ✓ Post-implementation support
- ✓ System monitoring & fine tuning

13. for the selection of ERP package, state the issues to be considered.

June 2009

While selecting the ERP package, the performance of following issues should be taken into account:

- (i) Better inventory management and control.
- (ii) Improved financial reporting and control.
- (iii) Automation of certain tasks that were performed manually to increase productivity.
- (iv) Improved production planning.
- (v) Better information on stocks at various locations.
- (vi) Using an integrated system as opposed to disparate systems at different locations, thereby eliminating errors of duplicate entries.
- (vii) More accurate costing of products.
- (viii) Better credit control.
- (ix) Improved cash flow planning.
- (x) Automatic quality control and tracking.
- (xi) Better after sales services.
- (xii) Better information and reporting to top management.

14. Why does an organization implement an ERP package and evaluate the various available ERP packages for assessing suitability? Mention the various evaluation criteria that are required to assess the suitability of ERP package on implementation.

May 2009; Nov 2010

Reasons for implementation of ERP package: ERP implementation in the organization brings together in one platform different business functions, different personalities, procedures, ideologies & philosophies with an aim to pool knowledge base to effectively integrate & bring worthwhile & beneficial changes in the organization.

Reasons why an organization does evaluation of various available ERP packages for assessing suitability:

- (i) Implementation of ERP is a risky effort since it involves considerable amount of time, efforts & valuable resources. Even with all these, the success of an implementation is not guaranteed.
- (ii) The ability of ERP package to manage & support dynamically changing business process is a critical requirement for the organization and therefore, the package should be expandable & adaptable to meet these changes.
- (iii) The ERP implementation methodology involves several steps, of which, one is evaluating the various available ERP packages to assess suitability.

Criteria for evaluation of various ERP packages: Evaluation of ERP packages are done based on the following criteria -

1. Flexibility: (i) ERP package should enable the organizations to respond quickly to changing environment; and

(ii) Allows the organization to concentrate on new products & markets.

2. Comprehensive: (i) ERP package should be applicable across all sizes, functions & industries.

(ii) It should have in-depth features in -

- Accounting & Controlling;
- Production & material mgt;
- Quality mgt & plant maintenance;
- Sales & distribution;
- Human resource mgt (HRM); and
- Project mgt

(iii) It should also have info & early warning systems for each function and enterprise-wide business intelligence system for informed decision-making at all levels.

(iv) It should be open & modular.

3. Integrated: ERP package should integrate the functions like sales & material planning, production planning, warehouse mgt, financial accounting, and HRM; thereby enabling the knowledge workers to receive the right info & documents at the right time.

4. Beyond the company: ERP package should support & enable inter-enterprise business processes with customers, suppliers, bank, govt & business partners and create complete logistical chain **covering** the entire route from supply to delivery; multiple geographies, currencies & country specific business rules.

5. Best business practices: The software should enable integration of all business operation in an overall system & should include the best business practices that reflect the experiences, suggestions & requirements of leading companies across industries.

6. New Technologies: ERP package should incorporate cutting-edge & future-proof technologies such as object orientation into product development and ensure inter-operability (i.e. able to be operated) with internet & emerging technologies.

7. Other Factors to be considered:

- Global presence of package
- Local presence
- Mkt targeted by the package
- Price of package
- Obsolescence of package
- Ease of implementation of package
- Cost of implementation

- Post-implementation support availability

15. Write down the guidelines which are to be followed before starting the implementation of an ERP package.

RTP Nov 2012; RTP May 2013; May 2013

There are certain general guidelines which are to be followed before starting the implementation of ERP package. These are:-

- ✓ Understanding the corporate needs & culture of the organization & then adopt the implementation techniques to match these factors.
- ✓ Doing a BPR exercise prior to starting the implementation.
- ✓ Establishing a good communication network across the organization.
- ✓ Providing a strong & effective leadership so that people down the line are well motivated.
- ✓ Finding an efficient & capable project manager.
- ✓ Creating a balanced team of implementation consultants who can work together as a team.
- ✓ Selecting a good implementation methodology with minimum customization.
- ✓ Training end-users.
- ✓ Adapting the new system & making the required changes in the working environment to make effective use of the system in future.

16. What are the Expectations & Fears of mgt during Post-Implementation of ERP / Explain Post-implementation Scenario

These are the scenarios which emerge after ERP implementation but these start coming in the mind of mgt & start at the time of ERP implementation. These scenarios start emerging in the form of "Expectations & Fears".

A few of popular **Expectations** are:

- An improvement in processes.
- Increased productivity on all fronts.
- Total automation & disbanding (i.e. breaking up) of all manual processes.
- Elimination of all manual record-keeping.
- Improvement of all key performance indicators (KPI).
- Real-time info systems available to concerned people on need basis.
- Total integration of all operations.

ERP implementation also gives rise to **Fears**, some of them are:

- Job redundancy (i.e. loss of job because it is no longer required now).
- Loss of importance (as info is no longer an individual prerogative/custody).
- Change in job profile.
- Increased stress caused by greater transparency.
- Individual fear of loss of authority.
- An organizational fear of loss of proper control & authorization.

Balancing the expectations & fears is a very necessary part of the implementation process.

17. What are the Risks & Governance issues in an ERP?

ABC limited had recently migrated to real-time integrated ERP system, As an IS auditor, advice the company as to what kinds of business risks it can face?

Nov 2009; May 2011; RTP May 2012; RTP May 2013

Write short notes on reasons for failure of ERP projects.

May 2013

Organizations face several new business risks when they migrate to real-time, integrated ERP systems. Those risks include:

- 1. Single sign on: Advantage** - It reduces the security administration effort associated with administrating web-based access to multiple systems. **Disadvantage** - This feature introduces an additional risk i.e. an incorrect assignment of access may result in inappropriate access to multiple systems.
- 2. Single point of failure:** Since all the organization's data & transaction processing is within one application system, failure to that system (which is ERP's main server) may bring down the working of entire organization info system.
- 3. Structural changes:** Significant structural changes relating to personnel & organization may be associated with re-engineering or re-designing business processes, for which, there is a risk of non-acceptance and incompatibility.
- 4. Change management:** ERP implementation not only requires the implementation of computer based integrated system but also requires changes in existing processes, culture & working methods of organization's staff or stakeholders. Therefore, adapting to new processes, culture & working methods for staff is always a big challenge.
- 5. Job role changes:** The change mgt & structural changes may require the change in job profiles of staff. Here, risk is that the staff often resist for change in their job profiles.
- 6. Distributed computing experience:** ERP provides a distributed data processing system which helps to process data from anywhere. Inexperience with implementing & managing distributed computing technology may create significant challenges.
- 7. Increased system access:** Increased remote access by users & outsiders and high integration among application functions may allow increased access to application & data.
- 8. Dependency on external assistance:** Organizations may sometimes require external assistance. Unless such external assistance is properly managed, it could introduce security & resource mgt risk that may expose the organizations to greater risks.
- 9. Audit Expertise:** The complexity of ERP systems has created specialization such that each specialist may know only a small fraction of entire ERP's functionality in a particular core module. Therefore, specialist expertise is required to effectively audit & control an ERP environment.

10. Privacy & Confidentiality: There is a risk of disclosure of personal confidential info to greater extent as ERP systems are connected with multiple external data sources.

18. Why do ERP projects fail so often?

ERP is a set of best practices for performing the various duties in an organization that may be related to finance, mfg or warehouse etc. But due to some reasons ERP projects fail so often. These reasons may be as under:

1. **Resistance to change:** To obtain the maximum benefit from ERP, there must be cooperation from staff. But, if the staff using ERP in indifferent departments does not agree that the working methods embedded in ERP are better than those they are currently using, they will then resist using the software or they will demand the IT department to change the software to match the ways they currently using.

2. **Inability to manage advance technology of ERP:** To make the ERP software compatible to the existing ways of doing work, the IT department customizes the software. Customization may make the software more unstable & harder to maintain. This may cause ERP project to break down.

19. How does ERP fit with e-commerce?

ERP fits with e-commerce due to following reasons:

- ✓ Today, customers & suppliers demand access to the same info that an organization's employees require through ERP system.
- ✓ E-commerce means IT departments need to build two new channels of access into ERP systems viz. One for customers known as B2C and one for suppliers & partners known as B2B. These two audiences want two different types of info from one ERP system. Consumers want order status & billing info; and Suppliers & partners want just about everything else.

However, companies with e-commerce ambitions face a lot of hard integration work to make their ERP systems available over the internet. Thus, the integration of ERP & E-commerce requires careful planning.

20. How will you establish & implement Critical Success Factors (CSFs) & Key Performance Indicators (KPIs) in an organization, for achieving the benefits of implementation of ERP? May 2007

Explain the Concept of (a) CSFs, (b) Performance measures, and (c) KPIs

Explain the life of ERP after implementation.

Effective use of ERP is a direct result of steps taken at the time of implementation toward preparing the organization. Change integration has to be necessarily embedded in the **task list** for any ERP implementation. The main tool for this is the **process of communication** in all forms that are - written, oral, workshops, meetings etc. The process should start quite early by educating all layers of the mgt on the particular ERP product, its relevant functionality, limitations & benefits.

Critical Success Factors (CSFs): CSF is a factor that is critical in the success of an organization working. CSFs vary from industry to industry. The company should continuously evaluate its CSFs against KPI/Benchmark.

E.g. Time taken to handle a particular customer complains is a CSF.

From these CSFs, **Performance measures** required to address these CSFs should be selected.

Key Performance Indicators (KPIs): The numeric figures against performance measures can be classified as KPIs. KPI may vary from company to company or country to country and in some cases, KPI may not be available. Therefore, the company should select appropriate KPI for their CSF evaluation.

21. What are the post-implementation blues/problems/difficulties in ERP systems? Also list measures to overcome these Problems. OR

You are entrusted with the duty of implementing ERP in your office. You have taken care of all the preparation during implementation. However, during post-implementation, there will be need for course correction many times. What can be reasons for them? Nov 2010

The need for course correction during post-implementation of ERP may be because of the following reasons:

- (i) A change in the business environment requires a change in the CSFs resulting in a new or changed set of KPI necessitating re-configuration.
- (ii) A review indicates a need for change in some processes.
- (iii) Vision changes in the ERP & improvements in hardware & communication technology necessitate changes.
- (iv) New additions to the business require extra functionality.

22. What are the tasks for which the company should be ready for post-implementation period of an ERP system? May 2011

Having evolved the processes while the configuration, construction & implementation are in progress, the organization needs to ready itself for the post-implementation period. Some of the tasks that are to be performed are to:

- (i) Develop the new job descriptions & organization structure to suit the post ERP scenario;
- (ii) Determine the skill gap between existing jobs & envisioned jobs;
- (iii) Assess training requirements and create & implement a training plan;
- (iv) Develop & amend HR, financial & operational policies to suit the future ERP implementation; and
- (v) Develop a plan for workforce logistics adjustment.

23. List a few ERP vendors and briefly discuss the ERP packages offered by them. May 2012

There are a few ERP packages available in the mkt these days. Some of these are developed indigenously also. However, these indigenous packages may not be able to compete with the global ERP packages in terms of functionality & coverage of business segments & scale. Some of the global packages along with the vendors are listed below:

1. **Baan (The Baan Company)** : “Baan” was initially developed for an aircraft company “Boing” in nineties and it was subsequently launched as a generalized package in 1994. It offers sound technology & coverage of broad functional scope. It offers credible tools for business process analysis linked to implementation of its software.
2. **Business Planning & Control System (BPCS)**: It targets only mfg companies. It offers strong functionality for discrete & Kanban mfg. However, it lags in process oriented implementation tools & workflow.
3. **Mapics XA (Marcam Corporation)**: Mapics is a suite of 40 modules with good enough functionality. It offers robustness, easy implementation & reasonable value for money. Many users viewed it as a legacy application.
4. **MFG/Pro (QAD)**: This package is strong in repetitive mfg; originally designed to meet MRP II standards. It offers reliable mfg functionality & straight forward implementation.
5. **Oracle Applications (Oracle)**: It gives internet-enabled, network-centric computing. It also offers database, tools, implementation, applications & UNIX operating systems under one stop-shop umbrella. It is currently running on wide choice of hardware.
6. **R/3 (SAP)**: It is a mkt leader with excellent philosophy of matching business processes with its modules. It covers almost all business segments.
7. **Systems 21 (JBA)**: Its software license revenues are small compared to other major ERP vendors. It offers strong attractive features, reliable mfg solution.

24. What is meant by Business Process Re-engineering?

RTP Nov 2004

- (i) According to Hammer & Champy ; “BPR is the fundamental re-thinking & radical re-design of processes to achieve dramatic improvement in critical, contemporary measures of performance such as cost, quality, service & speed.”
- (ii) Radical re-design means BPR is re-inventing & not enhancing or improving. In a nutshell, BPR approach says that “whatever you were doing in past is all wrong”, do not get biased by it or reassemble your new system to redesign it afresh.
- (iii) Fundamental rethinking means asking the questions “why do you do what you do”, thereby eliminating business process altogether if it does not add any value to the customer.
- (iv) The business objectives of an enterprise viz. Profits, customer-satisfaction through optimal cost, quality, deliveries etc are achieved by **transformation of business processes** which may or may not require the use of IT.
- (v) Thus, BPR aims at transformation of business processes to achieve dramatic improvement.

25. Write short notes on Business Engineering.

Nov 2010, Nov 2012

- (i) **BE** has come out of merging of two concepts namely IT & BPR (i.e. $BE = IT + BPR$).
- (ii) BE is the re-thinking of business processes to improve speed, quality, & output of material or services.
- (iii) The emphasis of BE is the concept of **Process Oriented Business Solutions** enhanced by the Client-server computing in IT.
- (iv) The main point in BE is the efficient redesigning of company’s value added chains.
- (v) Value added chains are a series of connected steps running through a business which when efficiently completed add a value to enterprise & customers.
- (vi) IT helps to develop business models which assists in redesigning of business processes.

26. Write short notes on Business Management in the context of ERP.

ERP merges very well with common business mgt issues like BPR, TQM, mass customization, service orientation and virtual corporation etc. The basic objective of implementing an ERP program is to put in place the applications & infrastructure architecture that effectively & completely support the enterprise’s business plan & business processes.

27. What is Business Modeling? How can it be used for judging the suitability of ERP package?

The approach of ERP implementation is carried out using MIS planning. First of all, a model consisting of core business processes or activities of the business is to be developed. This is the diagrammatic representation of business as a large system with interconnection of subsystems or processes that it comprises of. The planning to arrive at the process is from top down whereas the MIS implementation is done from bottom up.

Features of Business Modeling:

- ❖ Business Processes
- ❖ Comprehensive Functionality
- ❖ Designs for all types of business
- ❖ Multi-National
- ❖ Business Engineering
- ❖ Client-server architecture
- ❖ Open system

The Data model consists of two elements:

1. A diagram describing various business processes & their interactions (i.e. Blueprint).
2. An underlying Data Model.

The Reference Model can be used by various companies to list their processes & data entities and if required can be subsequently modified to suit specific nature of requirements.

List of some of the entities forming a Data Model

Entity	Description
External data	Entities outside the firm that interact with it such as customers, suppliers, competitors & distributors. Also includes predictive data regarding economy & future events in external environment.
Internal Data	Data generated from the firm's TPS, internal forecasts or parameters monitored.
Personnel Data	Mostly includes profiles of employees, their skill levels, experience & past performance on various assignments.
Payroll data	Data about salaries, tax deductions, statutory forms & other deductions.
Inventory Data	Includes inventories of raw materials, goods in progress & finished goods.

Business Modeling in Practice: Most of the ERP packages available today enable flow charting business processes using standard flow chart symbols. By connecting symbols used for users, events, tasks/functions & other organizational info, complex business info can be analyzed. All ERP packages provide standard template for each of the processes so that actual processes can be compared & deviations analyzed. Business Modeling is the basis by which one can select & implement a suitable ERP package.

28. With reference to ERP package (SAP), briefly explain three modules of Enterprise Controlling. Nov 2013

W.r.t ERP packages (SAP), three modules of enterprise controlling are given as follows:

1. **EC-CS:** This component is used for financial statutory & mgt consolidation which also allows fully automated consolidation of investments even for many companies & complex investment structures.
2. **EC-PCA:** This module/component allows to work with internal transfer prices & at the same time to have the right values from company, profit centre, and enterprise perspective in parallel. Any transaction that touches an object such as customer order, plant or cost centre allocated to a profit centre will be automatically posted to EC-PCA.
It is also possible to take data directly from EC_PCA to EC_CS consolidation to prepare complete financial statutory statements & mgt reports in parallel. This provides the mgt with a consistent view of external & internal financial mgt reports.
3. **EC-EIS (Executive Info System):** EIS allows to take financial data from EC-PCA, EC-CS or any other application & combine with any external data such as market data, industry benchmarks and/or data from non-SAP applications to build a company specific comprehensive EIS.

Important Note: Please read the topic ERP Software Package (SAP) from “Study Material”.