

*Dear All,*

It gives immense pleasure to present this MICS notes, the objective of this notes is to clear the misconceptions from the minds of the students, who feel MICS as very difficult to pass / score

Among the eight papers of CA- Final, MICS is the most easiest and scoring subject as there are no numbers involved, except question numbers in question paper 😊

I have put in my best efforts to make this notes easy and understandable ,

**This is specially dedicated to my brother Sadiq Khan, writing in November 2009 & to my beloved friends.**

All the Best !!!

- CA Siddiq Ahmed Khan  
Bangalore ,  
apsak\_ca@yahoo.com

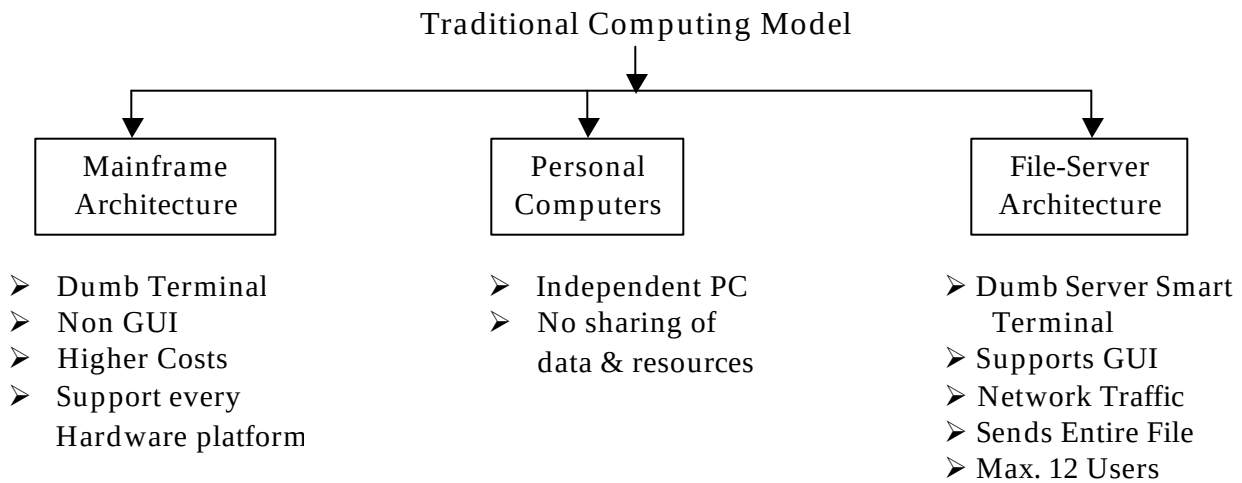
**Success factors for passing MICS - Paper -6**

- ☺ Refer only **Study material** issued by ICAI
- ☺ Good **memory (use Acronyms)**
- ☺ **Complete familiarity** of the **Syllabus**
- ☺ Clear understanding of question and **doubly confirm** the answers before writing in exam.
- ☺ RTP of respective exam **must** be covered (At least 20 marks from RTP)
- ☺ Use your practical knowledge **only** to understand the concept, not to present in exam, you should present only as per **Study Material**
- ☺ Questions asked in Immediate examination can be ignored
- ☺ **Repeated** reading will help you to score good marks
- ☺ “Knowing everything of something is better than knowing something of everything “ so for this paper, ensure completeness of syllabus.

**Methodology**

- ✓ First read the chapters from study material provided by ICAI
- ✓ Revise the chapter immediately from this notes and you can add extra text for your better understanding
- ✓ With the help of this summarized notes, the entire syllabus can be revised within 4 hours. And will be of great help as last minute revision day before exam.

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**Phase 1****Chapter - 6 - Enabling Technologies****Client Server (C/S) Model - (Cost Reduction Technology)**

- It's a form of distributed processing
- Divides processing work between server & work-station
- Server-Global Task; Client-Local Task
- Send only requested data

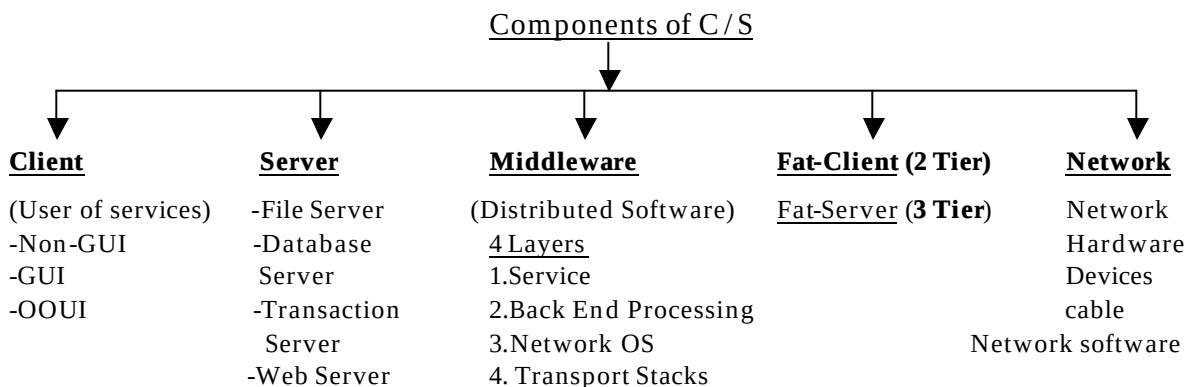
**Advantages / Benefits of Client / Server**

- |                                        |                                  |
|----------------------------------------|----------------------------------|
| 1. Cost Reduction                      | 7. Easy to add new hardware      |
| 2. Improved flow of information        | 8. Takes less people to maintain |
| 3. Direct access to data               | 9. User Friendly GUI             |
| 4. Increased data integrity & security | 10. SQL capability               |
| 5. Better Connectivity                 | 11. Data protection & security   |
| 6. Increased Productivity              | 12. Access to multiple servers   |

**Example of C/S :-** Online Banking, Call-Centre, E-Commerce.

**Elements of Client / Server**

- |                         |                     |
|-------------------------|---------------------|
| 1. Data Storage         | 4. Operating System |
| 2. DBMS                 | 5. User Interface   |
| 3. Application Software | 6. Display Devices  |



Middleware – It is distributed software that allows client & server to connect

Service Layer – Carries coded data from software application.

Back End Processing – Encapsulate network instructions.

Network OS – Adds additional instructions.

Transport Stacks – Transfers data packets to the designated receiver.

### **Considerations for Client /Server Security / Control Techniques to ensure security by IS**

#### **Audit**

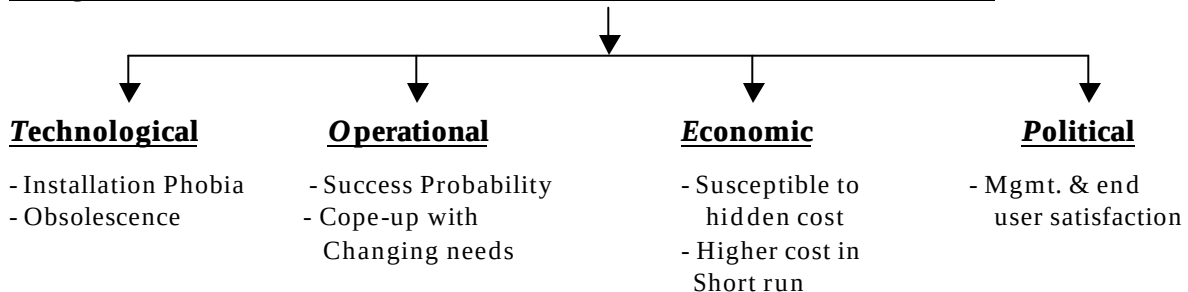
1. Disabling Floppy Drives
2. Disk-less workstations
3. Automatic booting
4. Network Monitoring
5. Data Encryption
6. Authentication System (Log-in ID & Password)
7. Smart Card System
8. Access only to required task.
9. All access points should be known.



don't confuse with IS audit (Chapter – 17)

### **Client / Server Risks** **T O P E** [😊 you can think of topi]

#### **Categories of risks involved in transition from mainframe to client Server**



#### **Server Centric Model**

- Programs are deployed, managed, supported and executed 100% @ server
- C/S with dumb terminals
- Processing is done on server, client does the data entry & gets display of information.

#### **Characteristics of Client server**

1. Distinguished from each user
2. Operates on separate computer platforms
3. Platforms can be independently upgraded
4. Serve multiple clients concurrently
5. Includes networking capability
6. Logics set at the client end
7. Runs of standard query language (SQL)
8. Provides data security
9. User-friendly GUI resided at client end



This icon represent **acronyms**

- Key letters used to remember
- Given only for most repeated questions

## Chapter - 7 - System Development Process

- Process of examining of business situation with the intent of improving it.

### System Analysis

### System Design

### **System Development Life Cycle [ S D L C ]** (Traditional Approach)

- Preliminary Investigation
- Requirement Analysis
- System Analysis (*Present & Proposed*)
- Design of System
- Acquisition & Development of software
- System Testing
- Implementation & Maintenance

### **Reasons for failure** to achieve system development objectives

1. Lack of senior management support
2. Changing user needs
3. Difficult to design strategic system (Because they are unstructured)
4. Incompatibility of staff with new technology.
5. No proper standard & method of project management & system development
6. Over-worked or under-trained development staff
7. Resistance to change
8. Lack of user participation in development
9. Inadequate testing & training.

### **System Development Approaches**

#### 1. **Traditional Approach**

- Activities are performed in sequence
- Work performed in each stage are reviewed by managers & users
- It takes years to develop, analyse & implement.
- EG : Transaction Processing system

#### 2. **Prototyping Approach**

- Used to develop smaller systems
- Useful when system requirement is not known or difficult to determine
- Developed in small parts (*prototypes*) & at lesser cost
- Developed prototypes are refined & either turned into final system or scrapped to develop a new real system
- EG: DSS, MIS, ES

### **Four Steps** **I DTO** [ 😊 you can think of Indirect Taxes ]

- a) **I**dentifying information system requirement
- b) **D**evelop the initial prototype
- c) **T**est & Revise
- d) **O**btain user's approval

**Advantages**

Less time consuming, active user participation, more reliable less costly, errors detected and eliminated early

**Disadvantages**

Process owners not willing to devote significant time, Experimented quite extensive  
Lack of documentation and Behavior problem

**3. End User Development Approach**

- End user is responsible for system development
- Low-cost technology
- Decline in standards & controls
- Reduction in quality assurance
- Unrelated & incomplete systems
- No experienced staff

**4. Top Down Approach**

- High Degree of top managements involvement

**Stages:**

- 1) Analyse the objectives & goals of the entity
- 2) Identify the functions. e.g. – Production, Marketing, R & D
- 3) Ascertain the major activities, decisions & functions
- 4) Find out the information requirement
- 5) Prepare information processing program

**5. Bottom Up Approach**

- Starts from Supervisory management (Used to design various sub-systems)
- Identification of life stream systems that are essential for day to day activities
- Identify basic transactions, file-requirements & programs and develop system for each such life stream
- Integration of data & such systems
- Addition of decision models & planning models
- Involvement of supervisory management.

**6. Systematic Approach**

- Used in small organizations in which no MIS personnel is involved.

**Steps:**

- 1) Identify requirements
- 2) Locate suitable software & hardware
- 3) Implement the system

**Reasons for Project Failure**

- Under estimation of time
- Under estimation of resources
- Under estimation of size & scope of project
- Inadequate control
- Inadequate planning
- Changing system specifications
- Lack of senior management participation



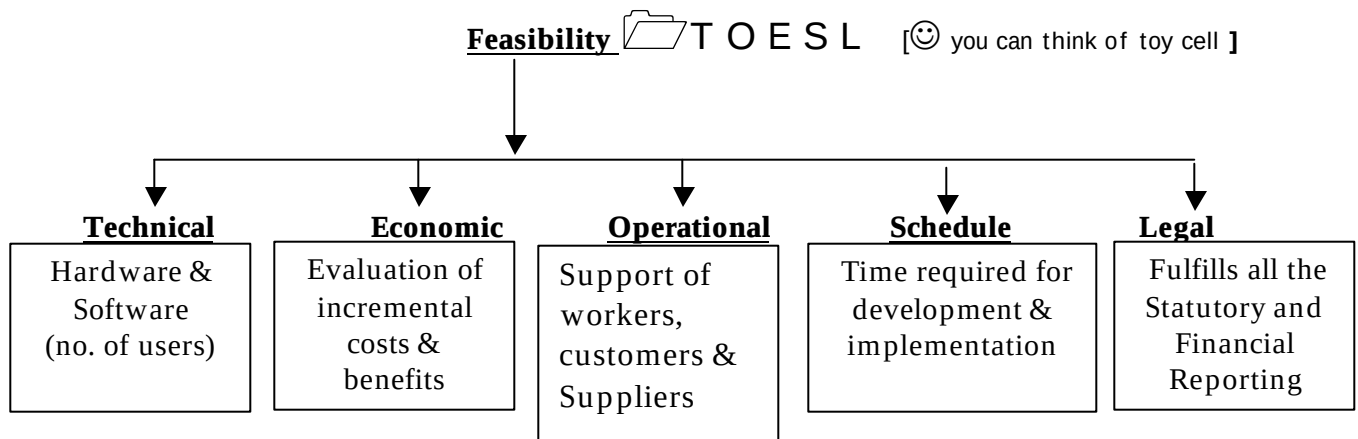
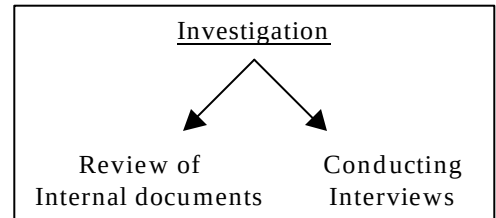
**Don't confuse with Reasons for failure to achieve system development objectives**

## System Development Methodology

- Standardized & documented set of activities used to manage system development project. Division of project into small modules.
- Deliverables (Specific report & documentation) must be produced periodically
- Approval of development process by users, managers & auditors (Sign Offs)
- System Testing
- Proper Training
- Prevent unauthorized changes to complete program by formalizing system modifications.
- Post implementation review.

### Preliminary Investigation

1. Starts when a problem / opportunity is identified by User or manager.
2. Clarify & understand the project request.
3. Determine the size of the project
4. Determine the feasibility of alternative approaches
5. Determine their costs & benefits
6. Final report to the management with recommendations.

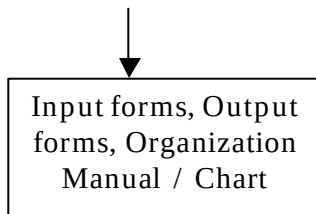


### Requirement Analysis

- Determining user needs
- Study of application area in depth
- Assessing the strengths & weaknesses of present system
- Reporting to management

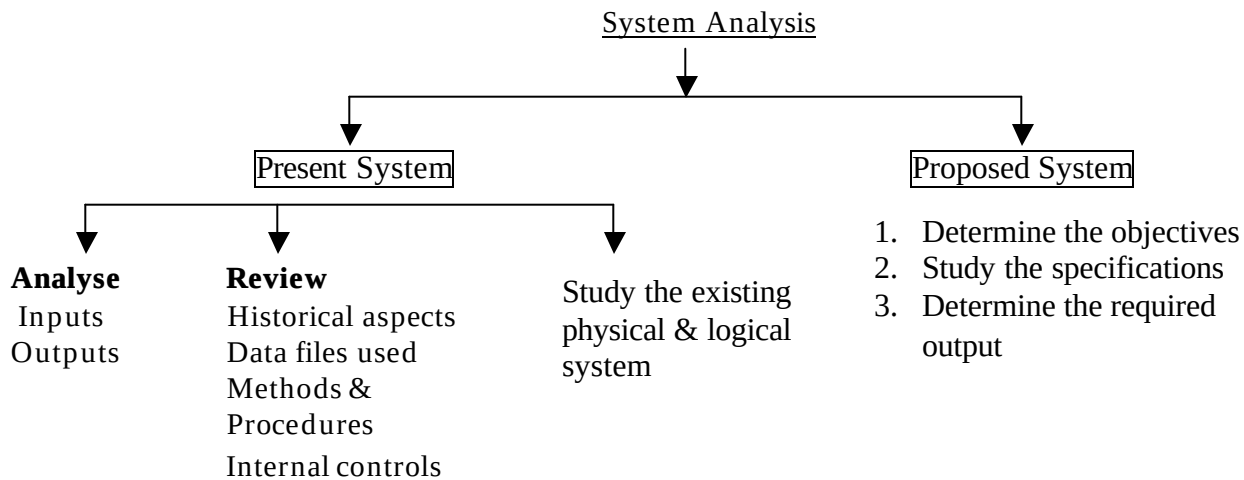
#### ➤ Fact Finding Techniques

- 1. **D**ocuments      2. **I**nterviews      3. **O**bservations      4. **Q**uestionnaire



• **D I O Q** [😊 you can think of honda dio in que]





### System Development Tools

1. **System Flow Chart** ( Process flow & information processing procedures) Presented by variety of symbols & connecting arrows.
2. **Data Flow Diagram** (Flow of data within an organisation)  
[Data sources & destinations, Data flows, Transformation process, Data Stores]

Symbols in DFD –

|   |                           |
|---|---------------------------|
| □ | Data Source & Destination |
| → | Data Flow                 |
| ○ | Transformation Process    |
| = | Data Storage              |

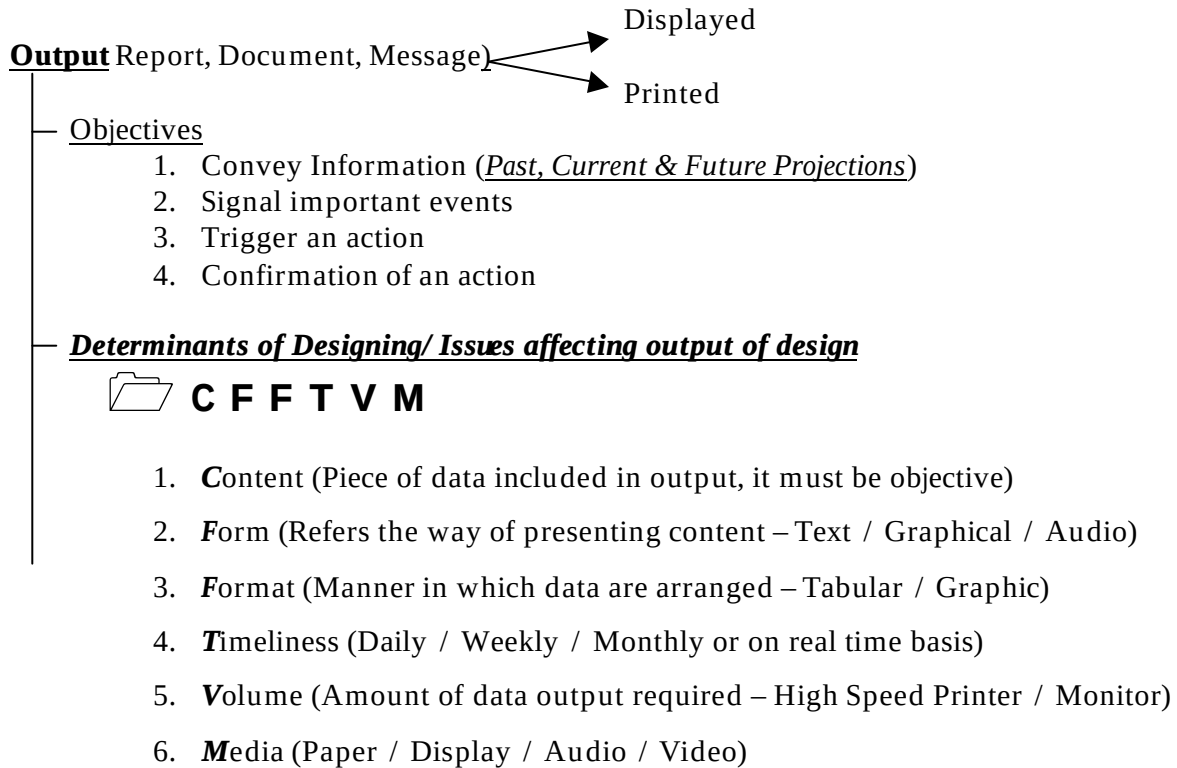
3. **Lay out forms & screens** (Pre printed forms)  
Used to design source document, output, display.
4. **System Components Matrix**  
Highlights basic activities of a system. e.g. – Input, Processing, Output & Storage
5. **CASE Tools** (Automation of anything that human do to develop systems)
6. **Data Dictionary** (Computer file containing descriptive information about the data items)
  - It contains information about each data item stored in the system, file in which it is stored, program that modifies it, authorised users & unauthorised persons.
  - It is updated with every change in data item.
  - Gives an audit trail to the auditor & helping aid in investigation.

### Category of Tools / System Development Tools

1. System Components & Flows (DFD and System component matrix)
2. User Interface (layout forms and screens)
3. Data attributes & relationships (data dictionary and entity relationship diagram)
4. Detailed system process (decision tree / table)

## Chapter - 8 - Systems Design

1. Review System's Requirements
2. Developing a model
3. Reporting to Management



**Input** (Efficient data capture, effective coding & appropriate data entry methods)

### **Guidelines for form designing**

1. Easy to fill (Proper flow, logical division & captioning)
2. Purposeful
3. Accurate completion
4. Attractive

### **Characteristics of good coding scheme**

[Code: - Brief no./ title / symbol used instead of lengthy / ambiguous description]

1. Unique Code
2. Brief
3. Convenient
4. Expandability (compatible with future growth)
5. Suggestive
6. Permanence

**Coding Schemes**

1. Classification codes (Used to classify record in a particular class)
2. Function codes (Used to describe a function e.g. – sold, delivered)
3. Significant digit subset codes (Permanent Account No.)  
Entire code is divided into meaningful parts.
4. Mnemonic Code (Linking with description e.g. MBA, C.A., C.S.)
5. Hierarchical Classification / Progressive Code

Data Storage                      Individual File System                      &                      DBMS

Design of data communication                      (Simple & Cost effective)

System Manual: (Contains Description, Flow, Output, Input, Persons responsible)

Please refer page 8.9 for 10 marks. – Factors to be considered designing printed output.

## Chapter - 9 - System's Acquisition, Software Development & Testing

### Acquisition of Hardware

1. Latest possible technology.
2. Speeds & capabilities.
3. Software Considerations.
4. Compatibility to future expansion.
5. Vendor selection & machine selection

### Acquisition of software (Pre-packaged Application Software)

(Sources may be computer manufacturer, software houses, retail stores, user groups and In house development)

#### Advantages

- |                         |                                 |
|-------------------------|---------------------------------|
| 1. Rapid Implementation | 3. Low Risk                     |
| 2. Quality              | 4. Lower Cost (No hidden costs) |

### Steps for selection of a computer system (Software & Hardware)

- |                                                              |                                             |
|--------------------------------------------------------------|---------------------------------------------|
| 1. Prepare design specification.                             | 2. Distribute request for proposal (RFP)    |
| 3. Analysis of proposals.                                    | 4. Contact present users of proposed system |
| 5. Conduct Benchmark Test.<br>(Actual testing of the system) | 6. Select the equipment / system.           |

### Evaluation & Ranking of Proposals (Factors) / Validation of vendor's proposal

1. Capability & Quality
2. Cost-Benefit Analysis
3. Cost of maintenance
4. Compatibility
5. Services provided by the vendor

- System Maintenance
- System Development Support
- Training
- Back-up
- Complement Hardware / Software
- Business hours v/s Round the clock service

### Method of Evaluation/ Validating RFP

1. Checklists (Subjective Method) –
  2. Point-scoring analysis
  3. Public evaluation reports
- (consultancy agency, present users, financial statement analysis, credit rating agency)

### Development of Software / Stages through which program has to pass

#### Stages [Program Development Life Cycle]

1. Program **Analysis**. [Analyse the output required, input available & processing]
2. Program **Design**. [Planning the basic layout of the program e.g. Flow Charts,]
3. Program **Coding** [Flow Charts converted into program statements. Eg:- Interpreter or Compiler] Coded instructions are entered into a magnetic media that constitutes source language. Then it is translated into machine language. It should be simple, short & require less processing time.
4. **Debug** the program. [including walkthrough, tests & review of program codes]
5. Thorough **testing** of the program.
6. **Documentation**.
7. Program **maintenance**.

Manager's involvement in Stage 1,2 & 7 (asked in past examination)

## **Program Development Tools / Design tools in Software Development**

 F P S 4 0 [😊 you can't think of anything, just remember as it is ]

1. **Flow Charts.** (Graphical Format)
  2. **Pseudo Code.** (English-Like statements)
  3. **Structure Chart.** (Similar to organization chart; No program logic)
  4. **4GL Tools.** (Automation of manual task)
  5. **Object Oriented Programming & Designing Tools.**
- ☹ - **don't confuse with System development tools**

### **Benchmarking problems for vendor's proposal**

1. It represents, part of buyers primary computer workload
2. It is oriented towards testing whether a computer offered by the vendor meets the requirements of buyers
3. Benchmarking problems can be applied only if job mix is clearly defined comprises of long jobs, short jobs, tape jobs and disk jobs
4. Provides realistic and tangible basis for computing vendors proposal
5. It is popular because it can test functioning of vendors proposal
6. **Disadvantages :** considerable time and effort to select representative of job mix

**Program debugging :** A process of correcting programming language, syntax and diagnostic errors to make 'Compiler clear', means successful conversion from source code to machine language instructions

Four steps: 1. Source program to compiler 2. Finding errors by compiler  
3. Correcting the error code, 4. Resubmit to compiler

### **Factors affecting make or buy decisions of application software**

- Availability of skilled manpower
- Cost of programming
- Backlog of program
- Suitability of software
- Time frame available for implementation
- Availability of sophisticated software

### **System Testing**

To be conducted prior implementation

1. Preparation of realistic test data.
2. Processing with new equipment
3. Thorough checking of the results.
4. Review of the results.

Best way parallel process

## Chapter – 10 - System Implementation & Maintenance

The process of ensuring that the information system is operational and then allowing user to take over its operation for use and evaluation is called 'System Implementation'

### Equipment Installation

- Necessary hardware to be ordered
- Use of Installation Checklist.
  - **Site Preparation** ( appropriate location, operating environment, planning space layout , electricity supply and carpets to be avoided
  - **Equipment Installation** (to be installed by the manufacturer and connected)
  - **Equipment Checkout** (turned on to check/test under normal operating conditions, devise and run extensive tests

### Training Personnel

- **System operator training** (fundamental of turning on the system, knowledge of normal operation, trouble shooting and contact names and numbers in case of emergency)
- **User training** (guidelines on equipment use and training on data handling activities )

### Conversion Procedures / Changeover from manual to computer system/ from existing to new system **D P G M D**

#### **1) Direct changeover**

Straightforward dropping old system & using the new one. Thorough testing is required before this conversion

#### **2) Parallel conversion**

Running old and new system parallelly, reliability of results are examined and move to the new system, Adv : checking the data ensure security Dis adv: cost of running two systems and virtually doubling the work

#### **3) Gradual conversion.**

Attempts to combine the best features of the earlier two plan Adv : allow user to get involved ,Dis adv :takes long time to get system in place

#### **4) Modular prototype conversion.**

Building of modular operational prototypes in a gradual manner, thoroughly tested before use Dis Adv : prototype is not feasible, special attention to be paid AP/AM/AR/ GL modules

#### **5) Distributed conversion.**

Implementing a new system in particular location, stores, business unit, franchise or bank, on successful completion others covered under new system

### Activities Involved in conversion **PFSSA**

#### **1) Procedure conversion**

Operating procedure documented, information on input, process and output to be provided and presented in clear and concise manner, brief meeting must be held , revisions to operating

#### **2) File conversion**

This phase to be started long before programming and testing are completed, to provide compatible format, data to store on magnetic disk and file conversion program thoroughly tested

#### **3) System conversion.**

Cut of point to be established, differences to be reconciled , old system to be dropped when new system performance is okay

**4) Scheduling personnel & equipment**

For the first time difficult task for managers, scheduling to be set in conjunction to departmental managers operational units, schedule to be realistic and to follow methods and procedures set in MIS

**5) Alternative plans in case of equipment failure.**

Priority to critical jobs – billing, payroll, and sales invoices and to clearly define who, how, what and why to do things in case of equipment failure

**Post-Implementation Evaluation / Evaluation of new system****How an evaluation system keep track to performed the new system in well manner**

Provides feedback, assess the value of information and performance of personnel and technology in the new system

It helps in answering the following questions like what adjustments are necessary and what adjustment to be made in future

| <b>Development Evaluation</b>     | <b>Operational Evaluation</b>                                                | <b>Information Evaluation</b>                                        |
|-----------------------------------|------------------------------------------------------------------------------|----------------------------------------------------------------------|
| Within budgets, within time lines | Transaction processing in time, accuracy, acceptable, timeliness and storage | Satisfaction of users can be used as measure to evaluate information |

- Evaluate whether the new system is working properly & the users are satisfied.
- Current adjustment in new system.
- Proposed adjustments in case of future development.
- 1) Development evaluation. [on schedule & within budget]
- 2) Operation evaluation.
- 3) Information evaluation

**System Maintenance**

- Arises due to malfunction / failure to anticipate during design
- Involves adding new data elements modifying reports and changing calculations
- Etc.

Scheduled maintenance – Anticipated and planned

Rescue maintenance – previously undetected malfunctions that were not anticipated but require immediate solution.

**Phase - 2****Chapter – 11 - Design Of Computerised Commercial Applications**

Please practice the flowcharts. And you can ignore the flowchart, which is asked in immediate exam and read Share accounting.

**Chapter – 12 - Enterprise Resource Planning – Redesigning Business**

Integrated software solution to all the functions of an organization.

**Definition**

ERP is a fully integrated business management system covering all functional areas.

Eg :- Logistics, Production, Finance, and Accounting & Human Resource.

It organizes & integrates the above-stated operations to make optimum use of resources & maximize return. It does the same thing but in a different manner.

**Benefits**

- |                                  |                                 |
|----------------------------------|---------------------------------|
| 1) Assists employees & managers. | 6) Reduction of paper document. |
| 2) Production scheduling.        | 7) Timeliness.                  |
| 3) Optimum capacity utilization. | 8) Accuracy.                    |
| 4) Reduce Inventory.             | 9) Quick response.              |
| 5) Better services to customers. | 10) Competitive advantage.      |

**Characteristics / Key Characteristics to Qualify for ERP**

1. Flexibility – Runs across various databases.
2. Modular & open system architecture – Modules can be interfaced / detached whenever required without affecting the other modules.
3. Comprehensive – suitable for wide range of business organization.
4. Beyond the company – Supports online to other business entities and organization
5. Best Business Practices – Imposes its own logic on a company's strategy, culture and Organization.
6. Use of EFT, EDI, Internet, Intranet, E-Commerce., etc.

**Features of ERP**

1. Provides multi platform, Multi facility, Multi currency and multimode manufacturing.
2. Supports strategic and business planning activities
3. Has end to end supply chain management
4. Coverage of all functional area
5. Perform core activities and increases customer services
6. Integration of systems across organization / Across globe
7. Solutions for better project management
8. Automatic introduction of latest technology like EFT, EDI & Internet.
9. Provides business tools like DSS & EIS.



**Benefits of ERP**

1. Best use of resources
2. Reduce paper documents
3. Improves timeliness of information
4. Greater accuracy, detailed presentation
5. Improved cost control
6. Inbuilt internal controls
7. Efficient follow -ups and cash collection
8. Better monitoring and quicker resolution of queries
9. Improvement in processes
10. Improvement in generating of data from analytical reviews

**Business Process Re-engineering [BPR]**

BPR is the fundamental re-thinking & re-designing of processes [not enhancing or improving] to achieve dramatic improvement.

**Business Engineering** = BPR + Information Technology

Re-thinking of business processes to improve speed, quality & output.

**Business Modeling**

- Consists of Core Business Processes / Activities & their inter-linking in a diagrammatic form.
- Planning – Top down approach.  
Execution – Bottom up approach.
- Readymade Business Modeling Templates are also available in the market.

**Method Of Implementing ERP / Steps involved in Implementation of ERP**

Before implementation ERP must be divided into modules & components. It must be customized as per the requirement. Implementation must be formalized.

- Identifying the needs for implementing ERP.
- Evaluating the present situation “AS IS”
- Deciding the proposed situation.
- Re-engineering of processes.
- Evaluation of various alternative ERP packages.
- Finalizing the ERP package.
- Installation of required Hardware & Network.
- Hiring the ERP consultants.
- User training.
- Final implementation of ERP package.

**ERP Vendors**

- 1) Baan (The Baan Company)
- 2) Oracle (Oracle)
- 3) R/3 (SAP)
- 4) System 21 (JBA)

### **Determination of ERP package** FCIBBN

1. Flexibility. [Ability to change according to future requirements]
2. Comprehensive. [Applicable to all industries]
3. Integration.
4. Beyond the company. [Supports processes with customers, suppliers, banks, etc.]
5. Best Business Practices. [Best Business Practices stored in ERP knowledge base]
6. New technology.
7. Other factors - Global presence / price of the package / obsolescence of the package / ease of implementation and duration / cost of implementation / post implementation support availability.

### **General guidelines before starting Implementation**

1. Analyze the corporate needs.
2. Business Process Re-engineering.
3. Establishment of good network.
4. Leadership & Motivation.
5. Appointment of Project Manager.
6. Hiring of consultants.
7. Selection of suitable package.
8. Training.
9. Final implementation.
10. List down the Critical Success Factors (CSF's) at departmental level.
11. Numeric values assigned to CSF's is called Key Performance Indicators (KPI's).

### **Life after implementation**

| <b>Expectations</b>              | <b>Fears</b>                            |
|----------------------------------|-----------------------------------------|
| 1. Increased productivity.       | 1. Job redundancy.                      |
| 2. Automation of processes.      | 2. Importance of information is lost    |
| 3. Improvement in KPI's.         | 3. Change in job profile                |
| 4. Elimination of manual work.   | 4. Loss of control & authorization.     |
| 5. Total integration.            | 5. Stress due to greater transparency   |
| 6. Real-time information.        | 6. Individual fear of loss of authority |
| 7. Improved networking features. | 7.                                      |

### **Ground realities after implementation**

The implementation should be top down  
 Key performance indicator are not measured  
 Same process better done manually  
 ERP project to be treated as business project  
 The objective of ERP to be identified documented and communicated.

### **ERP Audit**

- Necessary for ensuring the proper functioning of ERP package.
- May be specific or general.
- Evaluation of security, authorization & control.
- ERP audit trail.

## Chapter – 19 - CASE Tools and Digital Technology

### CASE Tools – Computer Assisted Software Engineering

Case provides software engineers to automate manual activities.

Case encompasses computer-based procedures, techniques and tools that can be used to develop, maintain and reengineer software

#### Categories of Case tools

| <b>Tools</b>                                                                                                                                                   | <b>Work benches</b>                                                                                                                     | <b>Environment</b>                                                                                                                                            |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Supports <b>individual process tasks</b> such as checking the consistency, design, compiling and comparing the result like Editors , compilers file compactors | Supports <b>Process phases</b> such as specification design, consists of set of tools like analysis and design, programming and testing | Support for all or <b>part of the software processes</b> includes several different workbenches like integrated environment and process centered environment. |

#### Integrated CASE Tools

➤ Specialized CASE Tools are combined together to form an integrated CASE Tool.

➤ 5 Levels :-

##### 1. Platform Integration

Integration of all the tools / workbenches run on the same platform. Platforms may be a computer / network / operating system.

##### 1. Data Integration

➤ Process of exchange of data by CASE Tool.

➤ 3 Levels

i. Shared Files :- All the tools recognize a single file format.

ii. Shared Data Structures :- Make use of shared data structures including program / design language information.

iii. Shared Repository :- Integrated around a object management system.

##### 3. Presentation Integration

Tool use a common standard presentation for user interaction.

[Window System, Comparable Functions and Interaction Integration]

##### 4. Control Integration

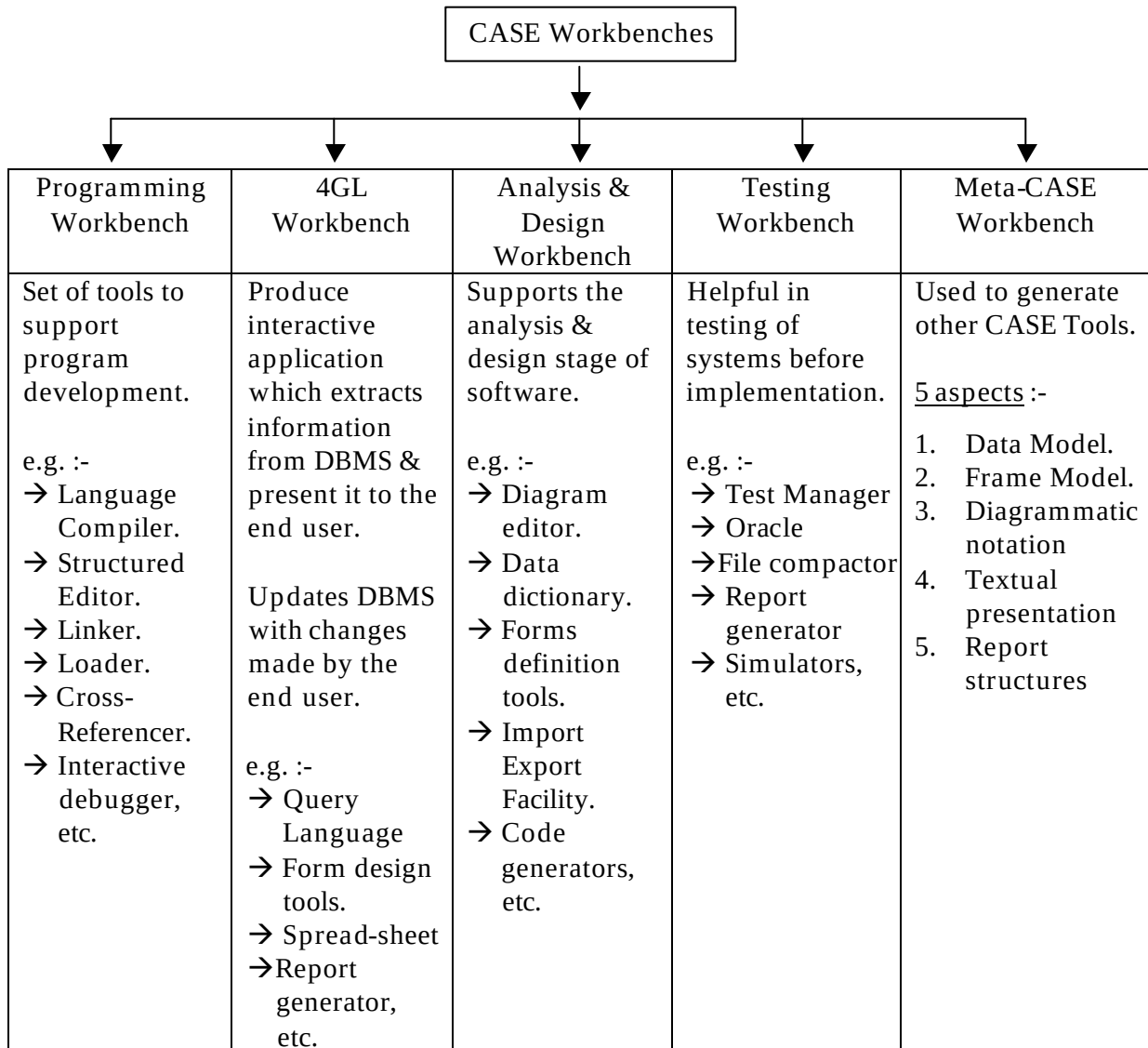
Mechanism to control the integration of other CASE Tools.

##### 5. Process Integration

Integrates the knowledge about processes, their phases, their constraints, etc. to support their activities.

Typical **Components** of a CASE Workbench

1. Diagram Editor.
2. Analysis, Checking & Correction.
3. Query Language.
4. Data Dictionary.
5. Report Generator.
6. Import/Export facility.



**Phase - 3****Chapter – 13 - General Controls in EDP Set –up****1. Operating System Control**

- Main functions of operating system are language translation, allocation of Computer resources, job scheduling, multi-tasking & lots more.
- Objectives of Operating System Control

| Protection       |                 |
|------------------|-----------------|
| Of               | From            |
| Operating System | Itself          |
| Operating System | Its environment |
| Operating System | Users           |
| Users            | Each other      |
| Users            | Themselves      |

| Operating System Control                                                                                                                                                                                                                                                                                                               |                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| OS Security                                                                                                                                                                                                                                                                                                                            | Threats to OS integrity                                                                                               | Controlling against Virus, etc.                                                                                                                                                                                                                                                                                                                             | Controlling Audit Trail                                                                                                                                        |
| 1. Log on procedure. [User ID & Password]<br>After Log-on, OS creates Access Token for each session.<br>2. Access Token. [Contains user ID, password & privileges granted]<br>3. Access Control List. [List of privileges to all the users]<br>4. Discretionary access control. [One valid user can assign to other at his discretion] | 1. Accidental. [Hardware failure, Os failure]<br>2. Intentional. [Abused authority & intruders]<br>3. Computer virus. | 1. Virus. [Penetrates OS]<br>2. Worm. [Occupies idle memory]<br>3. Logic Bomb. [triggered by pre-determined event]<br>4. Back Door. [Unauthorized access]<br>5. Trojan Horse. [Captures ID's & passwords]<br><u>Controlled by :-</u><br>1. Anti-Virus program<br>2. Anti-Viral program / vaccine<br>[Run continuously on a computer system to detect virus] | <u>Objectives –</u><br>1. Detecting unauthorized access. [Real time / subsequently]<br>2. Analyzing the reasons for such event.<br>3. Personal accountability. |

**2. Data Management Control**

| <b>Access Controls</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <b>Back-up Controls /Recovery features in DBMS</b>                                                                                                                                                                                                                                                                                                              |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>➤ <u>Flat File System</u> – Easy to control.</li> <li>➤ <u>DBMS</u> – 5 control features :-</li> <li>1. <u>User View</u> – Privileges to required users only.</li> <li>2. <u>Database Authorization Table</u> – Contain actions a user can take.</li> <li>3. <u>User Defined Procedures</u> – Series of personal questions.</li> <li>4. <u>Data Encryption</u></li> <li>5. <u>Biometric Devices</u> – Finger Prints, Voice Prints, etc.</li> </ul> | <ul style="list-style-type: none"> <li>➤ Back up may be in <u>magnetic disc</u> or in <u>magnetic tape</u>.</li> <li>➤ Back up controls in DB environment</li> <li>1. <i>Back-up</i></li> <li>2. <u>Transaction Log</u> – Provides an audit trail.</li> <li>3. <u>Checkpoint</u> – Several checkpoints in 1 hour.</li> <li>4. <i>Recovery Module</i></li> </ul> |

**3. Organisation Structure Control ( Segregation of duty)**

- i. Separating System Development from Computer Operations.
- ii. Separating System Development from Maintenance.
- iii. Separating Database Administration from other functions.
- iv. Separating Data Library from Operations.
- v. An Alternative Structure for System Development.

**4. Computer Centre Security & Control / Different types of securities required for computer System - V imp**

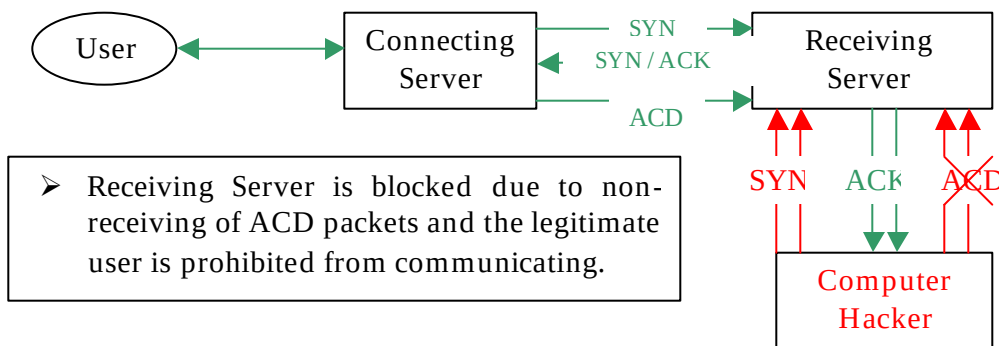
| <b>Risks</b>                                                                                                                                                                            | <b>Controls</b>                                                                                                                                                                                                                                                                   |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ol style="list-style-type: none"> <li>1. Fire Damage</li> <li>2. Water Damage</li> <li>3. Energy Variations</li> <li>4. Pollution Damage</li> <li>5. Unauthorized Intrusion</li> </ol> | <ol style="list-style-type: none"> <li>1) <i>Disaster Recovery Plan</i> <ol style="list-style-type: none"> <li>i. Emergency Plan</li> <li>ii. Back-up Plan</li> <li>iii. Recovery Plan</li> <li>iv. Test Plan</li> </ol> </li> <li>2) Insurance of Hardware &amp; Data</li> </ol> |

| <b>5. <u>System Development Controls</u></b>                                                                                                                                                                                                                                                                                                                                                                                                                          | <b>6. <u>System Maintenance Control</u></b>                                                                                                                                                                                                                                                                                                                                                                                                             |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ol style="list-style-type: none"> <li>i. <u>System Authorization</u> – Evaluation of the system before the development.</li> <li>ii. <u>Users Specifications</u> – Active involvement of user during the development phase.</li> <li>iii. <u>Technical Design</u> – Documentation of user specifications and development process.</li> <li>iv. <i>Internal Audit Participation</i></li> <li>v. <i>Program Testing</i></li> <li>vi. <i>User acceptance</i></li> </ol> | <ol style="list-style-type: none"> <li>i. <i>Maintenance Authorization, Testing &amp; Documentation.</i></li> <li>ii. <u>Source Program Library (SPL) Controls</u> – Documentation of retrieval, change, obsolescence, etc. of program in SPL.</li> <li>iii. <i>Password Control in SPL</i></li> <li>iv. <i>Audit Trail &amp; Management Report</i></li> <li>v. <i>Program Version Number</i></li> <li>vi. <i>Message Sequence Numbering</i></li> </ol> |

**7. Internet & Intranet Controls / Major Categories of Exposures in Communication Subsystem**

- 2 types of risks :-
  - i. Component Failure – Communication Line, Hardware & Software.
  - ii. Subversive Threats – Unauthorized Intrusion.

- a) Invasive Tap – Can read & modify data.
- b) Inductive Tap – Can read only.
- Subversive Attacks – Insert / Delete / Modify / Alter the sequence / Discard / Delay Messages.
- Control s :-
  - 1) Firewall
    - Controls the communication between two networks. Insulates the organization's network from external networks.
    - 2 Types :-
      - i. Network-level Firework – Low cost & low security level.
      - ii. Application Level Firewall – Costly & higher security level.
  - 2) Controlling Denial of Service Attacks



- 3) Encryption [Clear text → Cipher text → Clear text]
  - Conversion of data into secret codes for storage / transmission.
  - 2 types :-
    - i. Private Key Encryption – Single key used by both sender and receiver.
    - ii. Public Key Encryption – Public key is used to encrypt the data and private key is used to decrypt the data.

- 4) Message Translation Log  
Record of all incoming & outgoing messages.

- 5) Call Back Devices  
Calls back only the valid user to establish the connection.

## 8. Personal Computer Controls

| Risks                                                                                                                                                                                                                  | Controls                                                                                                                                                                                                                                                                                         |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Incompatibility of Hardware / Software.<br>2. Poor Data Security<br>3. Decentralization of processing<br>4. Computer Virus<br>5. No thorough testing.<br>6. Weak access control<br>7. Inadequate Back-up procedures | 1. Centralizing PC purchase<br>2. Physical locking of hardware<br>3. Regulating the use of floppy<br>4. Proper training<br>5. Virus prevention<br>6. <u>Proper Back-up arrangement</u> – Floppy, Dual Internal Hard Disks, External Hard Disk, Tape Back-up.<br>7. Multi-level password control. |

## Chapter – 14 - Application Controls in EDP Set-up

### **Input Controls**

#### 1. Source Document Control

Pre-numbered ; Used in Sequence ; Periodical Audit

#### 2. Data Coding Control / **what types of errors can corrupt a data code**

checking the integrity of data codes used in processing

- i. Transcription Error (addition / truncation / substitution)
- ii. Transposition Error (e.g. 38276-83276)

⇒ Check Digit - method of detecting data coding errors a control digit is added to code when originally assigned, establishes integrity.

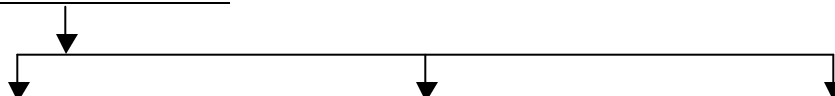
#### 3. Batch Control

- i. Batch Transmittal Sheet – It is prepared by user department & submitted along with batch of source document. It contains Batch no., Date, Transaction Code, Batch Totals.

[Batch Totals = Record Count, Hash Total & Control Total]

- ii. Batch Control Log – Contains the details of all the batches processed during a period.

#### 4. **Input Validation control**



| <b><i>Field</i></b> Interrogation                                                                                                                                                                    | <b><i>Record</i></b> Interrogation                                                                                                    | <b><i>File</i></b> Interrogation                                                                                                                                                |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ➤ Examines the characters in the field.<br>i. Limit Check<br>ii. <u>Data Type Check</u> (alphabetic / numeric)<br>iii. Valid Code Check<br>iv. Check Digit<br>v. Arithmetic Check<br>vi. Cross Check | i. Sequence Check<br>ii. Completeness Check<br>iii. Combination Check<br>iv. Redundant Data check<br>v. Password<br>vi. Authorization | ➤ It ensures that the required file is being processed.<br>i. Internal Label Check<br>ii. Version Check<br>iii. <u>Expiration Date Check</u> – Prevents deletion before expiry. |

#### 5. Input Error Correction

- i. *Immediate Correction* – at the time of input
- ii. *Create an Error File* – correction at a later time
- iii. *Reject the Entire Batch* – processing is done when all the records are made correct.

### **Processing Controls**

#### 1. Run-to-Run Control

- Monitors the batch as it moves from one programmed procedure(run) to another.
- Ensures that the batch is processed correctly and completely at each run.
- Recalculates control totals; Transaction Codes; Sequence Checks.



## 2. Operator Intervention control

Control of various tasks in which active involvement of operator is required.

## 3. Audit Trail Control

- Proper documentation of all the transactions.
  - (i) Transaction Logs (Log of all successful transactions)
  - (ii) Transaction Listings
  - (iii) Error Listings (List of unsuccessful transactions)
  - (iv) Log of Automatic Transactions
  - (v) Listing of Automatic Transactions
  - (vi) Unique Transactions Identifiers

## **Output Controls**

- Ensures that output is not lost / corrupted and their privacy is maintained.

### 1) Tape & Disk Output Controls

- ⇒ Parity Bit Checking (*Hardware Controls*)
- ⇒ Check Digits (*Software Controls*)
- ⇒ ECHO Check

### 2) Printed Output Controls

- i. *Verification of output* [Output directly / indirectly related to inputs and exception reports]
  - ii. Distribution of output
  - iii. Procedure for acting on exception reports
- ⇒ Real time system output are exposed to disruption, destruction, corruption, etc.

**Phase - 4****Chapter – 18 - Information Security**

- Information Security means protection of valuable information within the organization by applying various standards, measures, practices & procedures.

**Objective of Information Security**

1. Protecting the interest of the users of the information.
  2. Protecting the Information System.
  3. Protecting the communication.
- The security **objective** is met when the following conditions are satisfied :-
- (i) Availability – Information is available whenever required.
  - (ii) Confidentiality – Disclosed only to authorize persons.
  - (iii) Integrity – Protected against unauthorized modifications.

**Sensitive information**

Strategic Plans; Business Operations (List of client's name & add.); Financial Information.

**Principles of Information Security**  **AAMTRICS** [😊 'AAM' means mango TRICS means Tricks ]

1. Accountability – It must be formalized & communicated. Use of proper audit trail.
2. Awareness
3. Multi-disciplinary – Technological and non-technological issues.
4. Timeliness – Monitoring & timely response.
5. Re-assessment – Periodical changes.
6. Integration – Security system must be co-coordinated.
7. Cost Effectiveness
8. Social factors – Respecting rights / interests of others.

**3 types of Information Protection****1. Preventative Information Protection**

- (i) Physical (e.g. locks and guards, floppy access lock)
- (ii) Logical / Technical (e.g. passwords & authentications, etc.)
- (iii) Administrative (e.g. Security awareness)

**2. Restorative Information Protection**

⇒ Timely restoration of lost information after occurrence of the event.

**3. Holistic Protection**

⇒ Planning for unexpected and unknown events to happen.

**Approach to implement Information Security.**

- 1) Designing Security Policy that defines acceptable behaviors and reactions in case of violations.
- 2) Proper communication of Roles & Responsibilities to individuals –

| Individuals               | Responsibilities                                         |
|---------------------------|----------------------------------------------------------|
| Executive Management      | Overall responsibilities                                 |
| IS Security Professionals | Design & Implementation of security policy.              |
| Data Owners               | Maintaining accuracy & integrity                         |
| Process Owners            | Ensuring appropriate security embedded in there IS.      |
| Technology Providers      | Assist in implementation of Information Security System. |
| Users                     | Follow the set procedures.                               |
| IS Auditors               | Independent assurance.                                   |

- 3) Designing of Information System Security Framework after the policy has been approved by the governing body.
- 4) Timely Implementation of Information Security System after designing of framework.
- 5) Continuous Monitoring, disciplinary & corrective actions.
- 6) Adequate Training, Education & Awareness program to ensure proper functioning of Information Security.

**Role of Security Administrator**

- Responsible for controlling and co-coordinating the activities related to security aspects.
- Ensures adequate Information Security; Sets Policies; Investigates; Advices; Trains the users; Monitors the activities related to Information Security.

## Chapter – 15 - Detection of Computer Frauds

⇒ Computer fraud means obtaining unfair advantage over another person, computer, or organization using computer, computer network or computer resources.

### **Measure adopted to detect computer frauds**

1. Conduct frequent audits – External / Internal / Security Audit / BS7799
2. Use of computer security officer
3. Use computer consultants - to test and evaluate security procedures
4. Monitor system activities – log to maintained and log to record who, when and what accessed
5. use fraud detection software
6. use computer forensic tools (disk imaging analysis)
7. Normal file structure – free space, lost chains, detected files and temporary internet files

### **Why should business take computer fraud seriously**

Business entity depends on network and computers

Dependent on EFT and EDI

Business connected through Internet – exposed to more risks

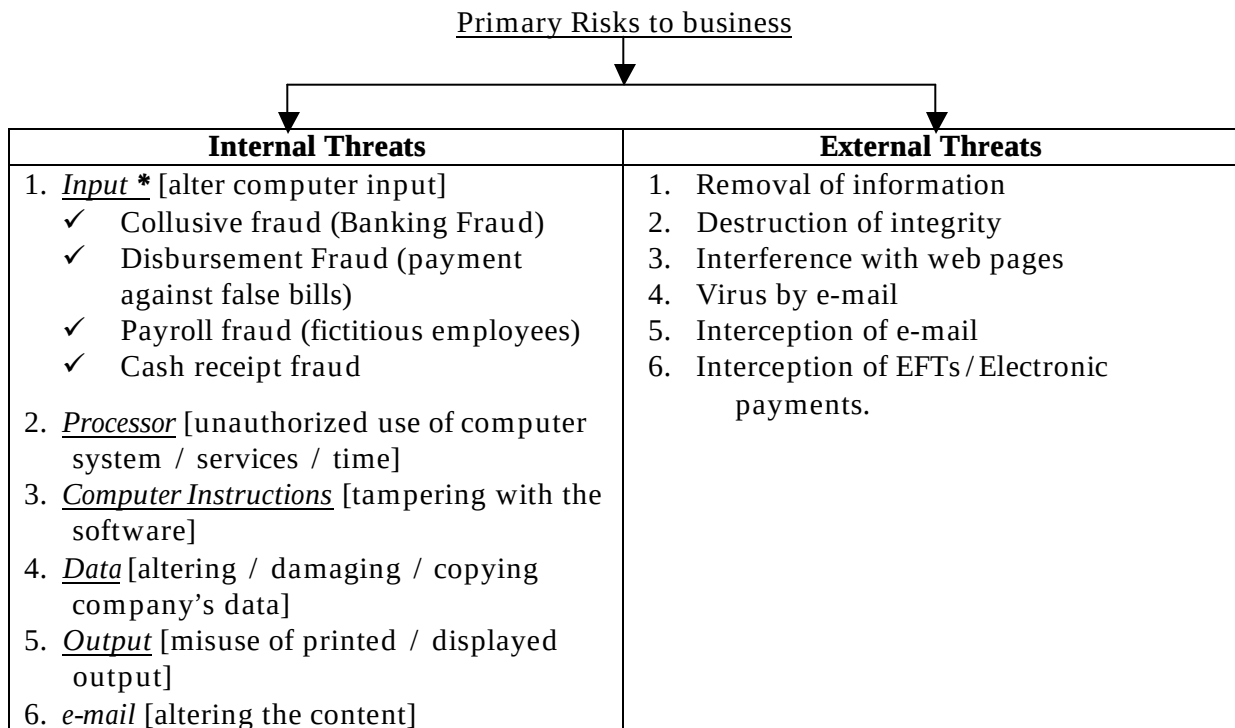
Growth of electronic cash – risk of theft destruction and misuse

### **Computer Fraud includes**

- Theft, unauthorized access, modification, copy or destruction of software, sensitive & confidential information.
- Theft of money using computer.
- Theft, destruction of computer hardware.
- Financial / reputation damage to a business using computer.

### **Examples of Computer Frauds**

- Investment fraud (offering high rate of return)
- Secret market fraud (pretends & influence that there is a confidential market for a particular financial instrument offering a high rate of return)
- Pyramid Schemes (offer high return on contribution & invariably collapse)
- Hacking (unauthorized access / modification to data / software)
- Cracking (Hacking with malicious intention)
- Abuse of computer system by employees (for personal purpose)
- Software piracy (unlicensed copy of software)



\* Exam question - Computer frauds committed through input.

**Reasons for Internet Fraud / substantiate with reasons to the view that there is a steep rise in the Internet computer fraud, and why many institutions unable to contain it.**

- Unregulated (no license fee, no central authority)
- Global origin – no particular place to create
- Difficult to distinguish genuine from fraud
- Fraudulent sites
- No prescribed jurisdiction
- No verification system for genuineness of information
- Ambiguity on definition of fraud
- Many frauds go undetected / unreported
- Poor network security.

**Preventing computer frauds / Measures that can reduce potential for fraud**

1. Make fraud less likely to occur
2. Use proper hiring and firing process
3. Manage disgruntled employees
4. Train employee in security and fraud prevention measures
5. Fraud awareness
6. Telephone disclosures
7. Punishment for unethical behaviour
8. Signed confidentiality agreements

**Controls to prevent fraud/ increase the difficulty to commit fraud**

1. Develop Strong internal controls
2. Segregation of duties
3. Require vacation and Rotate duties
4. Restrict access to computer equipment and data files
5. Encrypt data and programs
6. Protect telephone lines
7. Protect the system from viruses
8. Control sensitive data
9. Control laptop computers

**Detection methods**

- Conduct audit at regular interval
- Appointment of Computer security officer
- Hiring of computer consultants
- Maintenance of System activity log
- Fraud detection software
- Computer forensic tools – In this technique deleted files are recovered. Exact copy of disk is taken through disk imaging technique & investigation is done without the knowledge of the fraudster. [Disk Imaging & Analysis Technique]

**Security methods**

- Take proper insurance cover
- Keeping back-up at remote location
- Develop contingency plan
- Using special software to monitor the activities

Please refer study material for computer fraud and abuse techniques Page – 15.9

**Disk imaging and analysis techniques – v important** page –15.17

## Chapter – 16 - Cyber Laws and Information Technology Act, 2000

### Objectives of the Act

- Grant legal recognition to electronic transactions (EDI and E-commerce)
- Legal recognition to digital signature authentication
- Facilitate electronic filing of documents with govt authorities
- Facilitate electronic storage of data
- Facilitate Electronic Fund Transfers
- Recognition for maintaining books of account by banker in electronic form

### Scope of this Act

Extend to all over India and also to any offence committed thereunder outside India.  
Enforced from 17<sup>th</sup> October 2000.

### Definitions

#### Asymmetric Crypto System

Key Pair consisting of a private key (for **creating** digital signature) and a public key (to **verify** the digital signature).

#### Digital Signature

Authentication of electronic record by means of an electronic method.

#### Secure System {Hardware, Software & Procedure}

- ✓ Is secure from unauthorized access
- ✓ Provide a reasonable level of reliability
- ✓ Suited in performing the intended functions.
- ✓ Adhere to generally accepted security procedures.

### Power of CG to make rules in respect of digital signature (Section – 10 )

1. Type of digital signature
2. Manner and format for affixing it.
3. Manner & procedure to identify the originator.
4. Control procedures to ensure security, Integrity & confidentiality.
5. Any other matter to give legal effect to digital signature.



### Damage to Computer, Computer system, Computer network, Computer hardware etc.

#### (Section 43)

- |                                                                                                                                                                                                                                                                                                                                                                                   |   |                                                                                                            |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>➤ Accesses or secures access to</li> <li>➤ Downloads or copies any data from such</li> <li>➤ Introduces or causes to introduce any virus into the</li> <li>➤ Damages or causes to damage any</li> <li>➤ Denies or causes denial access to such</li> <li>➤ Provides assistance to access to</li> <li>➤ Tampering or manipulating</li> </ul> | } | Computer<br>Computer System<br>Computer Network<br>Computer Resource etc.<br>(Compensation upto Rs. 1 Cr.) |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|------------------------------------------------------------------------------------------------------------|

Penalties

- Failure to furnish information                      upto Rs.1.5 lakh for each failure
- Failure to file return                                      upto Rs.5000/- per day
- Failure to maintain books                              upto Rs.10000/- per day
- Hacking with computer system                      upto 2 lakhs/imprisonment upto 3yrs./both
- Misrepresentation                                      upto 1 lakh/imprisonment upto 2yrs/both
- Breach of confidentiality                              upto 1 lakh/imprisonment upto 2yrs/both

Power of CG to make rules (Sec 87)

- By notification in the official gazette and in the electronic gazette
- Matters to be specified in the rules
  - ✓ Manner of authentication by means of digital signature
  - ✓ Electronic form of filing, issue, payment etc.
  - ✓ Type and manner of affixing digital signature.
  - ✓ Qualification, disqualification and terms & conditions of service of controller etc.
  - ✓ Standards to be observed by controller
  - ✓ Form and manner of application for license.
  - ✓ Form for application for issue of digital certificate. etc.
  - ✓ Qualification /experience of the adjudicating authority

Duties of certifying authorities

- Make use of hardware/software that are secure from intrusion
- Reasonable level of reliability to suit the performance of intended functions
- Procedure to ensure secrecy and privacy
- Observe standards specified by regulations
- Certified authority to ensure every person employed complies with Act
- Authority to display a license in a place or premises which carries on the business
- Certifying authority shall disclose its digital signature containing public key

Steps to create Digital Signature

- Electronic record is converted into “Message Digest” using mathematical function known as “Hash Function” which freezes the electronic record.
- Private Key attaches itself to the message digest.

Liabilities of Companies

- Every person who was in-charge / responsible for day-to-day activity & the company shall be deemed to be guilty of such offense & shall be liable to be punished & proceeded against.
- Every Manager, Director, Officer with whose connivance such offense was committed shall also be liable.
- No liability if he proves his innocence.

➔ Controller shall act as repository for all digital signatures issued under this act.

Grey Areas, which are not covered by the Act

- Protection from domain names
- Infringement of copyright laws
- Jurisdiction aspect of electronic contracts
- Taxation of goods and services trading through E- commerce
- Stamp duty aspect of electronic contracts



## Chapter – 17 - Audit of Information Systems

### **Auditing concerns / primary concerns**

- Audit trails – backward and forward
- Integrity of the transactions
- Handling of exceptions
- Testing whether performing as stated
- Authorization of system
- System overrides authorization process
- Compliance with statutory
- Adequate controls between interconnected systems
- Adequate security procedures
- Recovery/ backup procedures
- Operation platforms are compatible and controlled
- Redundancy in eliminated

### **Computer auditing approach different from manual auditing due to**

- Electronic evidence
- Computer terminology
- Automated processes – processing and logic of the concepts
- Exposed to new risks
- Reliance on controls not possible

### **Scope & Objectives of IS Audit**

- Computerized system & applications
  - Appropriate, efficient and adequately controlled, to ensure valid, reliable, timely, secure input processing and output
- Information processing facilities
  - Ensure timely accurate and efficient processing and applications
- System development
- Management of IS
- Client/ server, telecommunications, and intranets

### **IS auditor's role**

- Establish control objectives
- Eliminate potential risk
- Review to determine areas of correction and improvement
- Control over assets of entity

**The sole purpose of audit information systems, to review and evaluate an internal control that protect the system and safeguards the assets**

**IS Audit Objectives**

- To secure/protect computer equipment, programs and communications from unauthorized access
- Program development and acquisition performed as per management's authorization
- Accuracy and completeness of transactions processed
- Inaccurate and improperly authorized source data to be handled as per managerial policies
- Computer data files are accurate, complete and confidential

**Audit of Computer processing**

**(In online systems, conventional audit trail is difficult and almost impossible why ? Past exam question)**

- Understand & evaluate the processing controls.
- Ensure that they are practically followed
- Periodical review of all the controls
- Elimination of control deficiencies.
- Test data processing – Processes a series of correct & incorrect data and reverse the effect of test data after auditing.

**I - Concurrent Audit Techniques**

(Continuous monitoring of system and input on a real time basis)

**1. Integrated test facility**

- Places set of fictitious records
- Records may represent a branch, division, unit or customer
- Fictitious records do not affect actual records
- Employee remains unaware
- Auditor compares processed data with expected results
- Suits in online processing systems
- Does not disrupt regular operations

**2. Snapshot Technique**

- Examines the way transactions are processed
- For selected transactions marked with special code that triggers snap shot process
- Snap shot data recorded in separate file and reviewed by auditor to ensure correctness

**4. System control audit review file (SCARF)**

- Uses embedded audit modules to continuously monitor the transactions
- The transactions with special audit significance will be recorded in SCARF or Audit log
- Criteria : specified rupee limits, inactive accounts
- Auditor reviews and follow up questionable transactions

**5. Audit hooks**

- Flags suspicious transactions & display a message at the auditor's terminal its also called 'Real time notifications'

**6. Continuous and Intermittent Simulation (CIS)**

Same as SCARF, but applied for databases, in case of serious discrepancies, CIS prevents the database from executing the update process,

**Relevance of concurrent audit techniques**

Applied in case of online transactions, with huge amount / transactions

**II - Analysis of Program logic**

(Time consuming & require programming language proficiency)

- Detailed analysis of the program will be done
- Automated flowcharting programs ( Automatically generates flow chart from Source code)
- Automated decision table programs

**Source Data Controls**

- Detection of inaccurate & unauthorized source data.
- Input control matrix (control applied to each field of input data)
- Periodical review of control procedures to maintain effectiveness

**Data Files Controls**

- Data storage risk (access, modification, destruction)
- Audit procedures checklist

**Phase - 5****Chapter – 3 - Basic Concepts of MIS**

| Management                                                                                                                                                    | Information                                                              | System                                                                                   |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|------------------------------------------------------------------------------------------|
| → Determining the objectives<br>→ Developing plans<br>→ Securing & organizing various resources<br>→ Exercising adequate controls<br>→ Monitoring the results | → Reprocessing of data & putting them into a meaningful & useful context | → Consisting of a no. of elements operating together for accomplishment of an objective. |

- ⇒ MIS is a network of information that supports management decision-making.
- ⇒ It uses the information resource for effective & better achievement of organizational objectives.
- ⇒ Canith defines “MIS as an approach that visualize the organization as a single entity composed of various inter-related and inter-dependent sub-systems to provide timely & accurate information for management decision making.

**Characteristics of an effective MIS**

1. **Management oriented** [Development of MIS starts from the need of the management]
2. **Management directed** [management actively directs the MIS development]
3. **Integrated** [all the information sub-system works as a single entity]
4. **Common Data Flow** [common input, processing & output procedures & media]
5. **Heavy planning element** [consumes substantial time to develop]
6. **Sub-system concept** [entire MIS is divided into smaller sub-systems]
7. **Common Database**
8. **Computerized**

**Misconceptions about MIS [and their clarifications]**

1. MIS is about the use of computers [it may or may not involve computers]
2. More data in reports means better information for managers [quality of data and not the quantity of data is relevant]
3. Accuracy in reporting is of vital importance [Information may be approximate. Accurate information involves higher cost]

**Pre-requisites of MIS**

- i. Database and DBMS  
User defined, Common data source, Access to authorized persons only, controlled by separate authority
- ii. Qualified system & staff
- iii. Support of top management  
Because subordinates are lethargic, large emphasis needs to be given, updating to the management about the status
- iv. Adequate control & maintenance of MIS  
Ensuring system is operating as it is designed to operate

## v. Evaluation of MIS

To meet the requirements, flexibility exists – requirement in future, capabilities and deficiencies of the system, maintain effectiveness of MIS

**Constraints in operating MIS**

- i. Non availability of experts
- ii. Difficulty in dividing MIS into sub-systems
- iii. MIS is non standardized
- iv. Non co-operation from staff
- v. Difficult to quantify the benefits of MIS
- vi. High turnover of experts

**Effects / Advantages of using computer MIS****Effect of applying computer technology for MIS**

- i. Increase in speed in information processing & retrieval of data
- ii. Expanded scope of use of information system
- iii. Scope of analysis widened (sales incentives zone wise)
- iv. Increased complexity of system design
- v. Integrated different subsystem
- vi. Increases effectiveness of information system
- vii. Provides more comprehensive information

**Limitations of MIS**

- i. The quality of output depends on quantity of input and process
- ii. MIS is not substitute of effective management
- iii. Its not flexible – difficult in fast changing complex environment
- iv. Cannot provide tailor made information packages
- v. Considers quantitative factors and ignores non quantitative factors like moral of the employee
- vi. Less helpful in making non programmed decisions
- vii. MIS is not workable if data is not shared
- viii. MIS effectiveness decreases due to frequent changes in top management

**Information needs in Management / Three broad categories of planning information requirement of executives**

| <b>Environmental Information</b> | <b>Competitive Information</b> | <b>Internal Information</b> |
|----------------------------------|--------------------------------|-----------------------------|
| → Govt. policies                 | → Industry demand              | → Sales forecast            |
| → Factors of production          | → Firm demand                  | → Financial budget          |
| → Technological information      | → Competitive data             | → Supplier factors          |
| → Economic trend                 |                                | → Internal policies         |

**Factors on which information requirement depends**

1. Operational function
2. Type of decision making
  - a. Programmed decisions
  - b. Non programmed decisions
3. Level of management activity

**Levels of management and their information requirements****Top level**

Concerned with task of designing, directing and managing the organization, they are accountable for effectiveness and efficiency of operations and they deal with long term plans policies and strategies

**Requirements**

| External                                                  | Internal                                                             |
|-----------------------------------------------------------|----------------------------------------------------------------------|
| Competition, regulatory, trends in economy and technology | Historical sales, profits, ratios, debts and project profitability's |

**Middle level / Tactical level**

Head of functional department, head of purchasing, finance manager, HR managers  
Responsible elaboration, classification and operationalisation of organizational goals

**Requirements**

| External                                                | Internal                                                                                     |
|---------------------------------------------------------|----------------------------------------------------------------------------------------------|
| Price changes, Shortages, demand and supply and targets | Current happenings, performance indicators, budget tracking and historical profits and sales |

**Supervisory level (Operational management)**

Section officers, office managers and superintendents 'Blue collar' employees

**Requirements**

| External                                                | Internal                                                                                                             |
|---------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|
| Sensitive changes affecting material supplies and sales | Unit sales/ expenses, current performances, shortages and bottlenecks, input and output ratio's, maintenance reports |

## Chapter – 4 - Systems Approach & Decision Making

### System Approach to Management

- ⇒ It's a way of thinking about management problems.
- ⇒ Each problem should be examined in its entirety and effect of the proposed changes to each part of the organization e.g. changing from batch production to continuous production will affect finance, warehousing, purchase department, etc.

### Decision-Making

- ⇒ It is a never-ending process of choosing a particular course of action out of several alternative courses for achievement of desired goals.
- ⇒ Pre-decisional, decisional & post-decisional functions are performed by management.

### **Steps involved in decision making / system approach for Solving problems**

1. Defining the problem
2. Analyzing the reasons
3. Identifying the alternative solutions
4. Evaluation of the same
5. Selection of the best alternative
6. Implementation of the solution

*Please refer*

Requirements of product planning and control system page – 4.22  
Objectives of production scheduling - page 4.23

### Classification of decisions

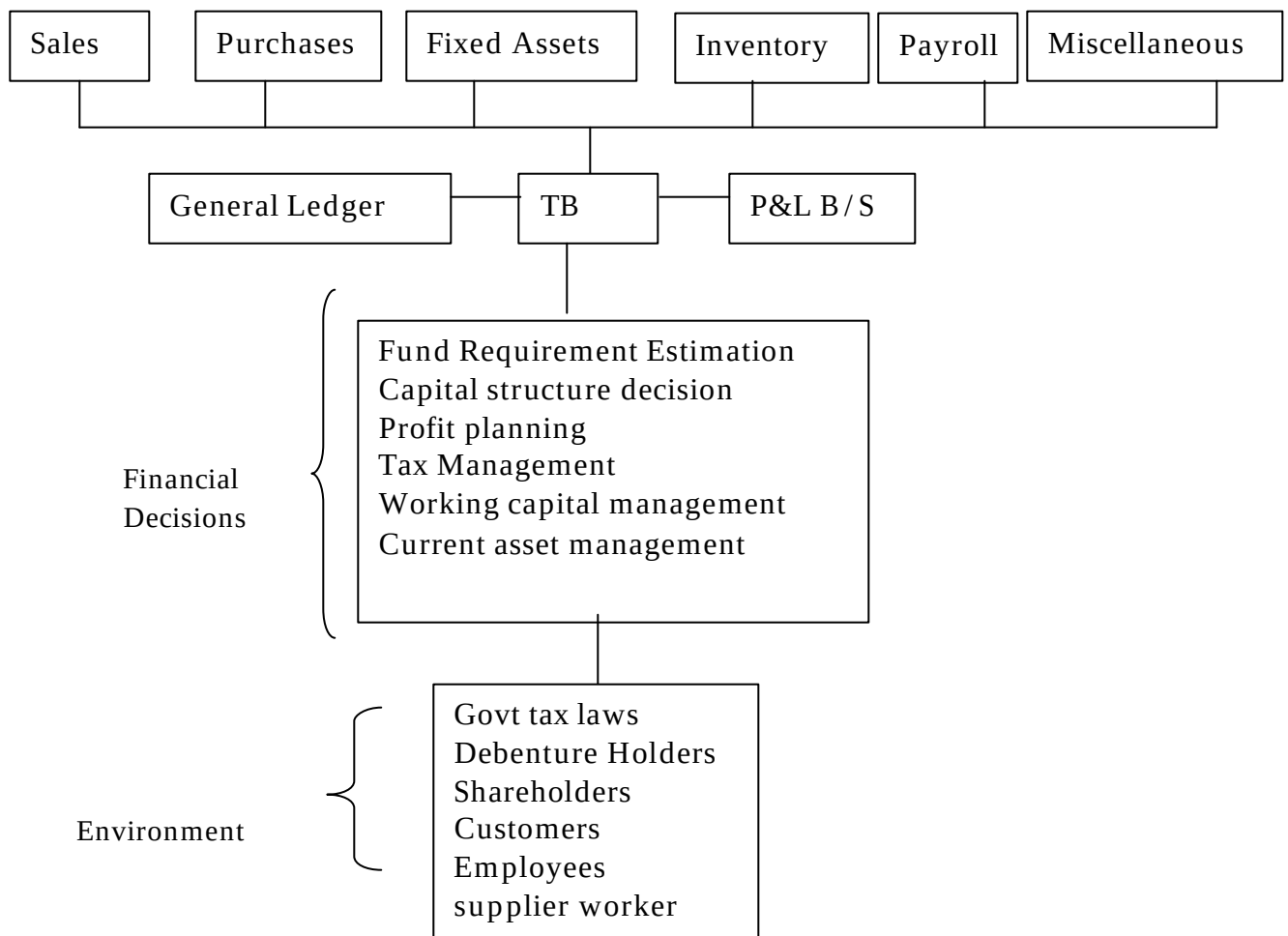
1. Programmed & non-programmed decisions
2. Strategic & tactical decisions
3. Individual & group decisions

### Functional Information Areas

| Finance & Accounting                                                                                                                                                                                                                                                                                                              | Production<br>(10 marks)                                                                                                                                                      | Marketing (5 marks)                                                                                                                                                                                                                                                                                                                      | Personnel (10 marks)                                                                                                                                                                                      |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Financial decision making involves decision regarding procurement & effective utilization of funds.<br><br>- Estimation of funds & the timing.<br>- Capital structure. (Optimum Mix)<br>- Capital budgeting (Investment)<br>- Profit planning<br>- Tax management<br>- Working capital management<br>- Current Assets management. | - Production Planning<br>- Production Control<br>- Material requirement planning (MRP)<br><br>Production Planning = What to produce<br>+ When to produce<br>+ How to produce. | Marketing bridges the gap between the firm & its customers.<br><br>- Sales support & analysis.<br>- Market research & intelligence.<br>- Advertising & promotion.<br>- Product development & planning.<br>- Product pricing<br>- Customer service<br><br><u>3 types of information</u><br>- Internal<br>- Competitive<br>- Environmental | - Proper recruitment<br>- Placement<br>- Training<br>- Compensation<br>- Maintenance<br>- Health & Safety<br><br><u>Sources of information</u><br>- Accounting information system<br>- Payroll processing |

**Decision making through MIS / computer model**

1. Makes accurate forecast of net income
2. Prepares short term profit plans and long range projections
3. preplanning information in budget preparations
4. calculates variances
5. triggers revised forecast
6. acts as early warning system for monitoring activities
7. indicates effect on income and cash flow
8. assists in planning the addition of new facilities
9. accomplish preceding items with great speed

**Financial decision diagram - 10 marks**



## Chapter – 5 - Decision Support & Executive Information System

### Decision Support System

- ⇒ It is a system that provides tools to managers to assist them in solving semi-structured & unstructured problems (it is not a means to replace the management).
- ⇒ Programmed Decision System replace human decision making (no management is involved).

### Properties of DSS / Significance

1. Support semi-structured & unstructured decisions
2. Ability to adapt the changing needs
3. Ease of learning & use

### Components of DSS

1. Users (Managers)
2. Databases
3. Planning Languages (General purpose, special purpose)
4. Model Base (Brain of the DSS, custom developed)

### Tools of DSS

- |                                                                                                                                                                               |   |                                                                     |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---------------------------------------------------------------------|
| <ol style="list-style-type: none"> <li>1. Data based software</li> <li>2. Model based software</li> <li>3. Statistical software</li> <li>4. Display based software</li> </ol> | } | <p>Integrated Tools combines all these software in one package.</p> |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---------------------------------------------------------------------|

### **DSS in Accounting**

1. Cost Accounting System (Generally used in Health Care industry)
2. Capital Budgeting System (Calculates NPV, IRR of various projects)
3. Budget Variance Analysis System (Forecasting budget & analyzing variances)
4. General Decision Support System, etc.

### **Executive Information System / Executive Support System**

- ⇒ It is a DSS designed to meet the special needs of top-level management and having additional capabilities such as e-mail.
- ⇒ It provides on-line access to information in a useful & navigable format (mouse & touch screen driven, pictorial & graphical presentation).
- ⇒ Types of planning by top level management

- (i) Strategic Planning (CEO level)
- (ii) Tactical Planning (Planning to carry out Strategic Planning)
- (iii) Fire Fighting (Major damage, new competitor, strike)
- (iv) Control (General controls)

- ⇒ Characteristics of Information obtained in EIS

- |                                                                                                                                                                                                                   |                                                                                                     |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|
| <ol style="list-style-type: none"> <li>(i) Unstructured</li> <li>(ii) High degree of uncertainty</li> <li>(iii) Future Orientation (Economic trend, govt. decision, consumer choice, competitor, etc.)</li> </ol> | <ol style="list-style-type: none"> <li>(iv) Informal Source</li> <li>(v) Lack of details</li> </ol> |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|

EIS Differ from traditional information system / MIS in the following ways

1. EIS is specifically tailor made
2. able to access data about specific issues
3. Provide extensive online analysis tools (Trends & Exceptions)
4. Broad range of internal and external data
5. Easy to use - touch screen driven
6. Directly used by executives without assistance
7. Presented by pictorial / graphical means
8. Presented in summary format
9. Works on 'What if' Parameters

Purpose of EIS

- Supports managerial learning about the organization
- Timely access to information – so that learning cycle continues unbroken
- Ability to direct management attention to specific areas

Set of principles to guide and design the EIS

- EIS measures must be easy to understand and collect
- EIS measures based on balanced view of organization objectives
- Performance indicators must reflect everyone's contribution
- EIS measures must encourage management and staff to share ownership of organization objectives
- EIS info must be available to everyone in organization

## Phase - 6

**Chapter – 1 - Basic concepts of systems**

- System is a set of inter-related elements that operate collectively to accomplish some common goal.
- Abstract System is an orderly arrangement of independent ideas or constructs.
- Physical System consists of physical elements rather than ideas.
- It is a collection of elements that surround the system and often interact with the system.
- The features that define and delineate a system form its boundary.
- Sub-system is a part of larger system.
- Inter-connections & interactions between the sub-systems are called interfaces.
- Decomposition is the process of dividing a system into sub-systems and so on.
- Simplification is the process of organizing sub-system to simplify their inter-connections (clusters of sub-systems are established).
- Supra-system is an entity formed by a system / sub-system and its related systems / sub-system

**Types of Systems**⇒ Deterministic System (Computer Program)

- ✓ Operates in a predictable manner
- ✓ Interaction among the parts is known with certainty

⇒ Probabilistic system (Inventory System)

- ✓ Describe in terms of probable behaviour
- ✓ Certain degree of error is always attached

⇒ Closed system

- ✓ No interaction across its boundary.
- ✓ Relatively closed system (it is a closed but not completely closed system in the physics sense).

⇒ Open System (Organisation)

- ✓ Actively interacts with other systems
- ✓ Tend to change to survive and grow due to change in external environment.

**System Entropy**

- System Entropy means decay, disorder or dis-organisation of a system.
- Negative entropy is the process of preventing entropy by input of matter, repair, replenish & maintenance.

**System Stress & System Change**

- A stress is a force transmitted by a system's supra-system that causes a system to change.
- It arises due to 2 reasons :- Change in the goal & Change in the achievement level.
- Systems accommodate stress through structural changes or process changes.

Information

⇒ Information is data that have been put into a meaningful & useful context.

⇒ **Characteristics**

- (i) Timeliness
- (ii) Purposeful
- (iii) Mode and Format (visual, verbal or written)
- (iv) Redundancy
- (v) Rate of transmission (bits per minute)
- (vi) Frequency (daily, weekly, or monthly)
- (vii) Completeness
- (viii) Reliability
- (ix) Cost-Benefit Analysis

**Business Information System / Categories of Information System**

- Transaction Processing System
- Management Information System
- Decision Support System
- Executive Information System
- Expert System (Artificial Intelligence) – It replace the need for human expertise. It is useful for a specific area e.g. taxation problem, refinery, etc.

## Chapter – 2- Transaction Processing System

- ⇒ Captures data and information reporting
- ⇒ Simplification of information processing by clustering business transactions
  - a) Revenue cycle
  - b) Expenditure cycle
  - c) Production cycle
  - d) Finance cycle

### Components of transaction processing system

1. Input
2. Processing (on-line processing, batch processing)
3. Storage
4. Output

### Types of codes used in transaction processing system

1. Mnemonic Codes
2. Sequence Codes
3. Block Codes
4. Group Codes