



CHAPTER - 1

AUTOMATED BUSINESS PROCESS

Categories of Business Processes

Operational Processes

Order to Cash Cycle (E.g.) – It is a set of business processes that involves receiving & fulfilling customer requests for goods or services.

An order to cash cycle consists of multiple sub-processes :-

- i) Customer Order
- ii) Order Fulfillment
- iii) Delivery Note
- iv) Invoicing
- v) Collections
- vi) Accounting

SUPPORTING PROCESSES

Human Resource Management (E.g.) –

Main Hr Process Areas are grouped into logical functional areas & they are as follows –

- i) Recruitment & Staffing
- ii) Goal Setting
- iii) Training & Development
- iv) Compensation & Benefits
- v) Performance Management
- vi) Leadership Development
- vii) Career Development



MANAGEMENT PROCESSES

Budgeting (E.g.) –

Having a formal & structured budgeting process is foundation for good business management, growth & development.

Budgeting Process –

Vision,

Strategic Plan,

Business Goals

Revenue Projections,

Cost Projection

Profit Projection,

Board Approval

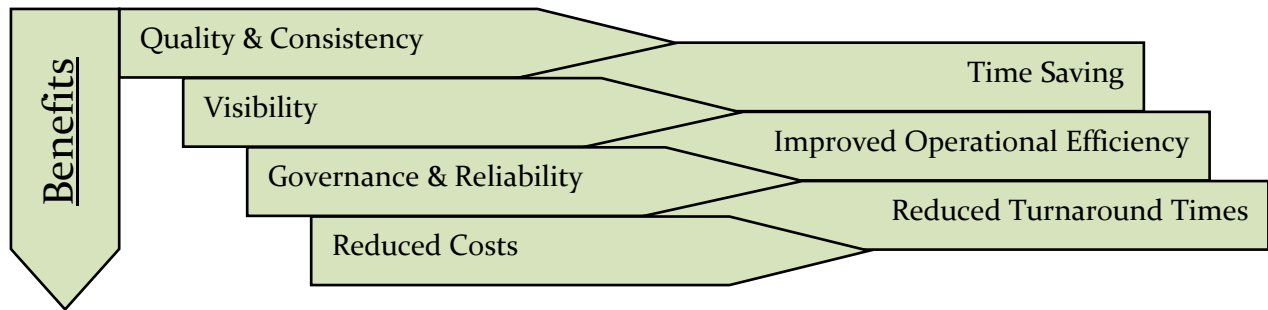
Budget Review



Business Process Automation (BPA)

It is technology-enabled automation of activities or services that accomplish a specific function & can be implemented for many different functions of company activities. BPA is tactic a business uses to automate processes to operate efficiently & effectively. BPA is tradition of analyzing, documenting, optimizing & then automating business processes.

Objectives of BPA			
Confidentiality,	Availability,	Integrity,	Timeliness

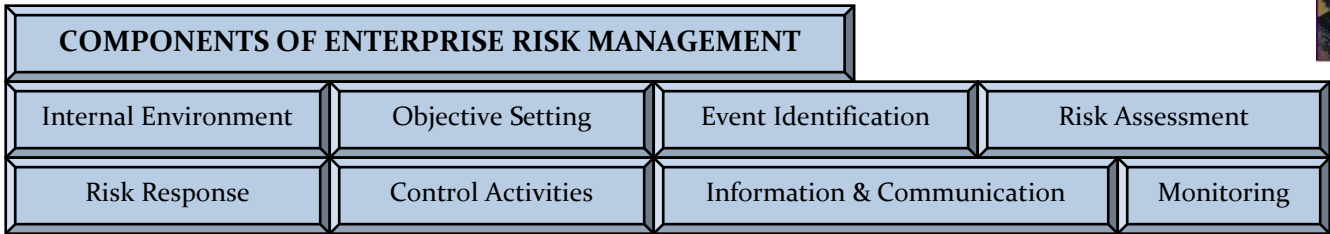


- Implementation of BPA :-**
- Step 1 : Define why we plan to implement a BPA?
 - Step 2: Understand rules / regulation under which enterprise needs to comply with?
 - Step 3: Document process, we wish to automate
 - Step 4: Define the objectives/goals to be achieved by implementing BPA
 - Step 5: Engage business process consultant
 - Step 6: Calculate the Rol for project
 - Step 7: Developing the BPA
 - Step 8: Testing the BPA

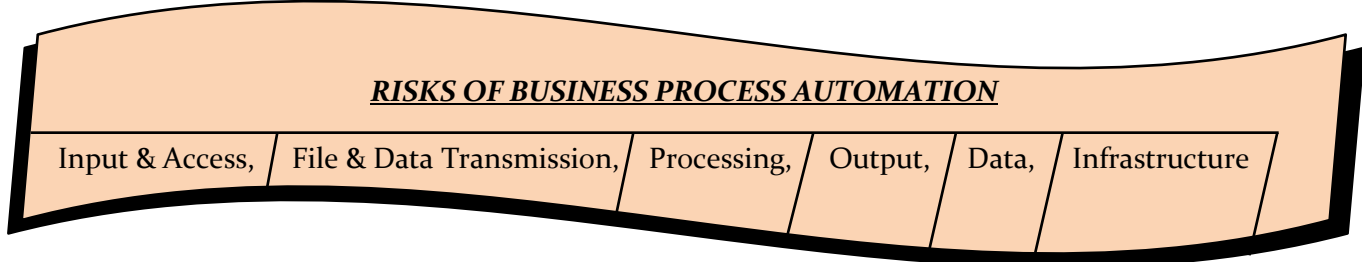


Enterprise Risk Management (ERM)
 It may be defined as a process, effected by an entity's Board of Directors, management & other personnel, applied in strategy setting.

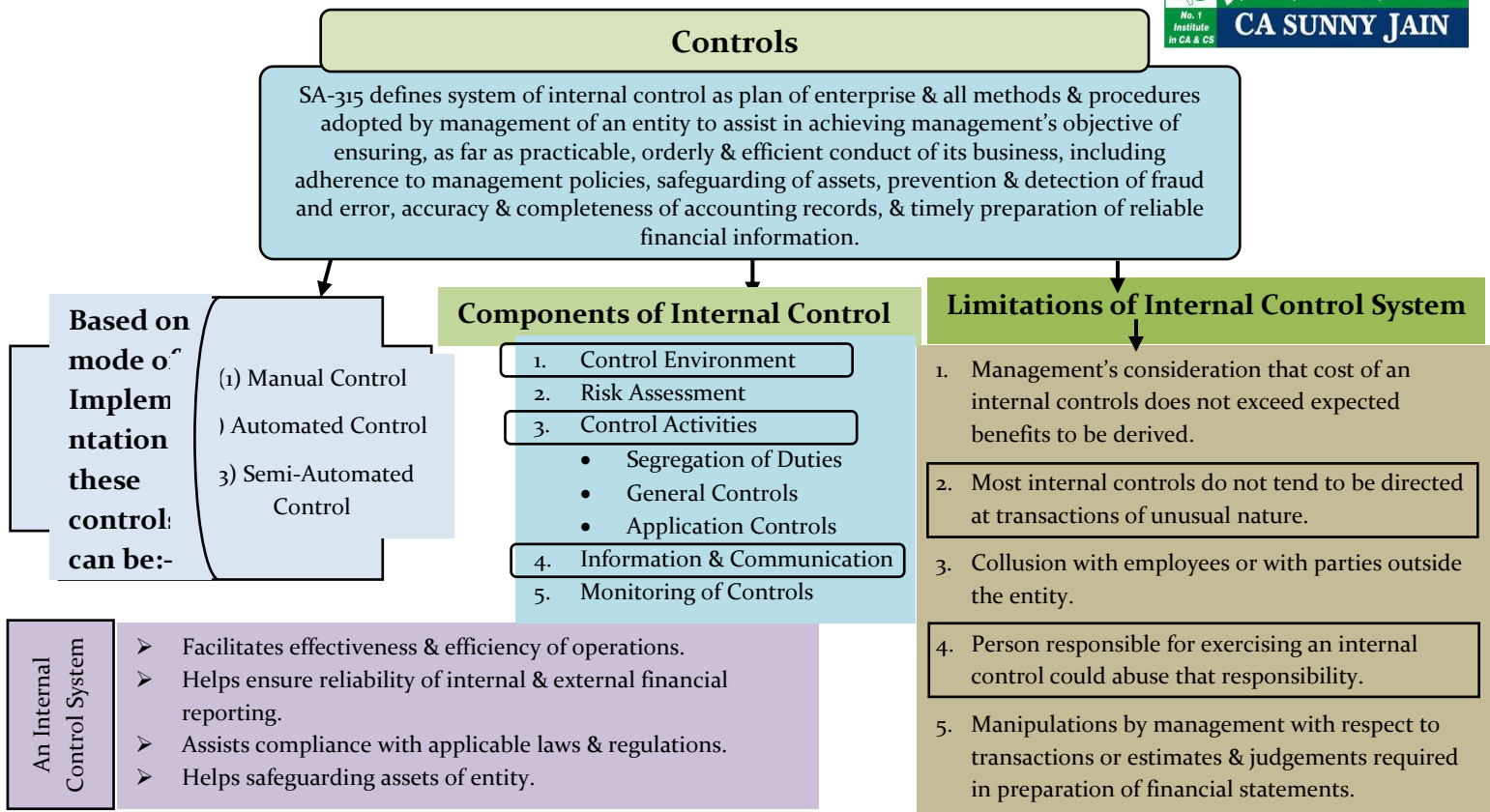
Benefits of Enterprise Risk Management	
Align risk appetite & strategy	Identify & manage cross-enterprise risks
Link growth, risk and return	Provide integrated responses to multiple risks
Enhance risk response decisions	Seize opportunities
Minimize operational surprises & losses	Rationalize capital



RISKS – Risk is any event that may result in a significant deviation from a planned objective resulting in an unwanted negative consequence.



Types of Business Risks : (1) Strategic (2) Financial (3) Regulatory (4) Reputational (5) Operational





Diagrammatic Representation of Business Process

Flowcharts – Flowcharts are used in designing & documenting simple processes or programs

Advantages of Flowcharts

- Quicker grasp of relationships.
- Effective Analysis.
- Communication.
- Documentation
- Efficient coding.
- Program Debugging.
- Efficient program maintenance.
- Identifying Responsibilities.
- Establishing Controls.

Limitations of Flowchart

- Complex logic
- Modification
- Reproduction
- Link between conditions & actions.
- Standardization.

Diagrammatic Representation of:-

1. **Customer Order Fulfilment**
2. **Order to Cash**
 - Sales & Marketing
 - Order Fulfilment
 - Receivables
3. **Procure to Pay**
 - User Department
 - Procurement Department
 - Vendor
 - Stores
 - Accounts Payable

Data Flow Diagrams – Processes are identified to functional departments. Data flow Diagrams (DFD) show flow of data or information from one place to another.

DFD basically provides an overview of

- (1) What data a system processes (2) What transformations are performed (3) What data are stored (4) What results are produced and where they flow.





RISKS AND CONTROLS FOR SPECIFIC BUSINESS PROCESS

Business Processes – Risks & Controls

Suitable controls should be implemented to meet requirements of.....

Levels of Computer controls

- Configuration
- Masters
- Transactions

Order to Cash (O2C) – Risks & Controls

It is a set of business processes that involve receiving & fulfilling customer requests for goods or services.



1. Customer order is documented.
2. Order is fulfilled or service is scheduled.
3. Order is shipped to customer or service is performed
4. Invoice is created & sent to
5. Customer sends payment
6. Payment is recorded in general

General Ledger – Risks & Controls

Steps in general ledger process flow are as follows:

- Entering financial transactions into system.
- Reviewing Transactions.
- Approving Transactions.
- Posting of Transactions.
- Generating Financial.

Procure to Pay-Risks & Controls

It is process of obtaining & managing raw materials needed for manufacturing a product or providing a service.

Inventory Cycle – Risks & Controls

It is a process of accurately tracking on hand inventory levels for an enterprise.

Phases of Inventory Cycle for Manufacturers:

- The ordering phase.
- The production phase.
- The finished goods & delivery phase.

Human Resources – Risks & Controls

Stage of HR cycle includes following:

- Recruiting & on boarding.
- Orientation & carrier planning.
- Career Development.
- Termination of Transition.



Fixed Assets – Risks & Controls

Steps of fixed assets process are as follows:

- Procuring an asset.
- Registering or Adding an asset.
- Adjusting the Assets.
- Transferring the Assets.
- Depreciating the Assets.
- Disposing the Assets.

Regulatory & Compliance Requirements



The Companies Act, 2013

- 1) Section 134- Financial statement, Board's Report, etc.
- 2) Section 143- Powers & duties of auditors & auditing standards.
- 3) Guidance Note on Audit of Internal Financial Controls over Financial Reporting.
 - Management's Responsibility.
 - Auditor's Responsibility.
 - Corporate Governance Requirements.
 - Enterprise Risk Management's.

Information Technology Act (IT Act)

(1) Advantages of Cyber Laws

(a) Email would now be a valid & legal form of communication, (b) Co's shall now be able to carry out electronic commerce using legal infrastructure provided by Act, (c) Digital signatures have been given legal validity & sanction in the Act, (d) Act throws open doors for entry of corporate companies in business of being Certifying Authorities for issuing Digital Signatures Certificates, (e) Allows Government to issue notification on web thus heralding e-governance



(2) Computer Related Offences

(a) Common Cyber-crime scenarios.

(b) Harassment via fake public profile on social networking site.

(c) Email Account Hacking.

(d) Credit Card Fraud.

(e) Web Defacement.

(f) Introducing Viruses, Worms, Backdoors, Rootkits, Trojans, Bugs.

(g) Cyber Terrorism.

(h) Online sale of illegal Articles.

(i) Cyber Pornography.

(j) Phishing & Email Scams.

(k) Theft of Confidential Information.

(l) Source Code Theft.

(3) Privacy

(4) Cyber Crime (a) Traditional Theft (b) Hacking

(5) Sensitive Personal Data Information (SPDI) – Rule 3 defines sensitive personal information as:

- Passwords
- Financial information
- Physical/physiological/mental health condition
- Sexual orientation
- Medical records & history
- Biometric information





CHAPTER - 2
FINANCIAL AND ACCOUNTING SYSTEMS

Integrated and Non-Integrated Systems



What is a System?
“a set of principles or procedures per which something is done; an organized scheme or method”

What is a Process?
It is a coordinated & standardized flow of activities performed by people or machines, which can traverse functional or departmental boundaries to achieve a business objective & creates value for internal or external customers.

TECHNICAL CONCEPTS :-

A) Working of any software
i) Front End & Back End
• **Front End** – It is part of the overall software which actually interacts with user who is using software.
• **Back End** – It is a part of overall software which does not directly interact with user, but interact with Front End only.

B) Installed Applications V/s Web Applications
i) Using Software
These are two ways of using a software including Financial & Accounting Software.
• Installed Applications are programs installed on hard disc of user’s computer.
• Web Applications of user’s computer, it is installed on a web server & it is accessed using a browser & internet connection.

ii) Application Software
• Application software performs many functions such as receiving inputs from user, interprets instructions & performs logical functions so a desired output is achieved.
• There are three layers which together form application.

ii) Cloud-based Applications
• These days many organizations do not want to install Financial Applications on their own IT infrastructure.
• Organizations increasingly are hosting their applications on Internet & outsource IT functions.



Non-Integrated System

Typical non-integrated environment where all departments are working independently & using their own set of data:-

- Human Resource
- Accounting
- Marketing
- Production
- Purchase
- Logistics
- Quality Control

Two major problems

Communication Gaps

Mismatched Data

INTEGRATED DRP

It is an overall business management system that caters need of all people connected with organization.

Advantages of an ERP System

- ❖ Ability to customize.
- ❖ Integrate business operations with accounting & financial reporting functions.
- ❖ Increased data security & application controls.
- ❖ Build strong access & segregation of duties controls.
- ❖ Automate many manual processes, thus eliminating errors.
- ❖ Process huge volumes of data within short time frames.
- ❖ Strong reporting capabilities which aids management & other stakeholders in appropriate decision making.

Features of an Ideal ERP System

Manufacturing - Financials - Human Resources - Supply Chain Management - Projects - Customer Relationship Management (CRM) - Data Warehouse





Concepts in Computerized Accounting Systems

Types of Data

A) Master Data – It is relatively permanent data that is not expected to change again & again.

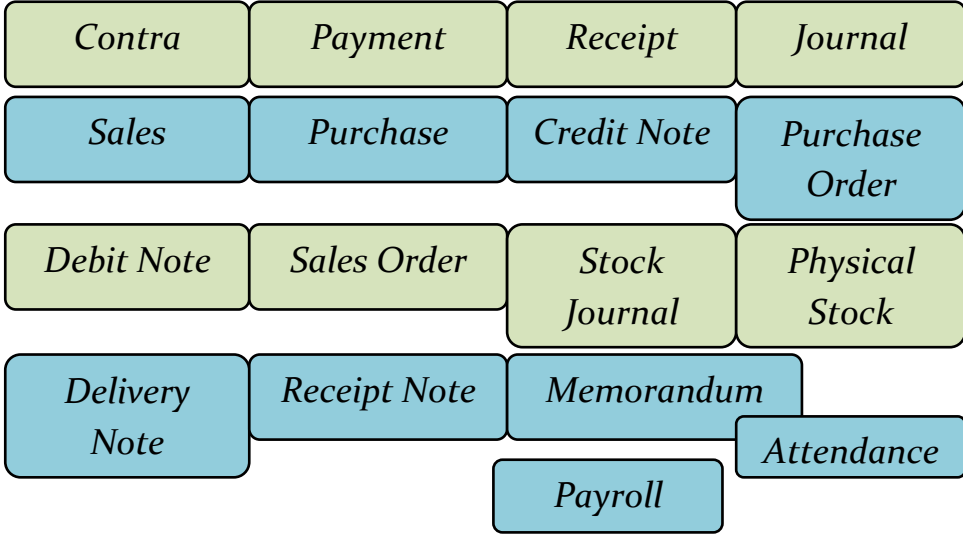
Types of Master Data

- Accounting Master Data
- Inventory Master Data
- Payroll Master Data
- Statutory Master Data

B) Non-Master Data – It is a data which is expected to change frequently, again & again & not a permanent data.

Voucher Types – It is a documentary evidence of a transaction

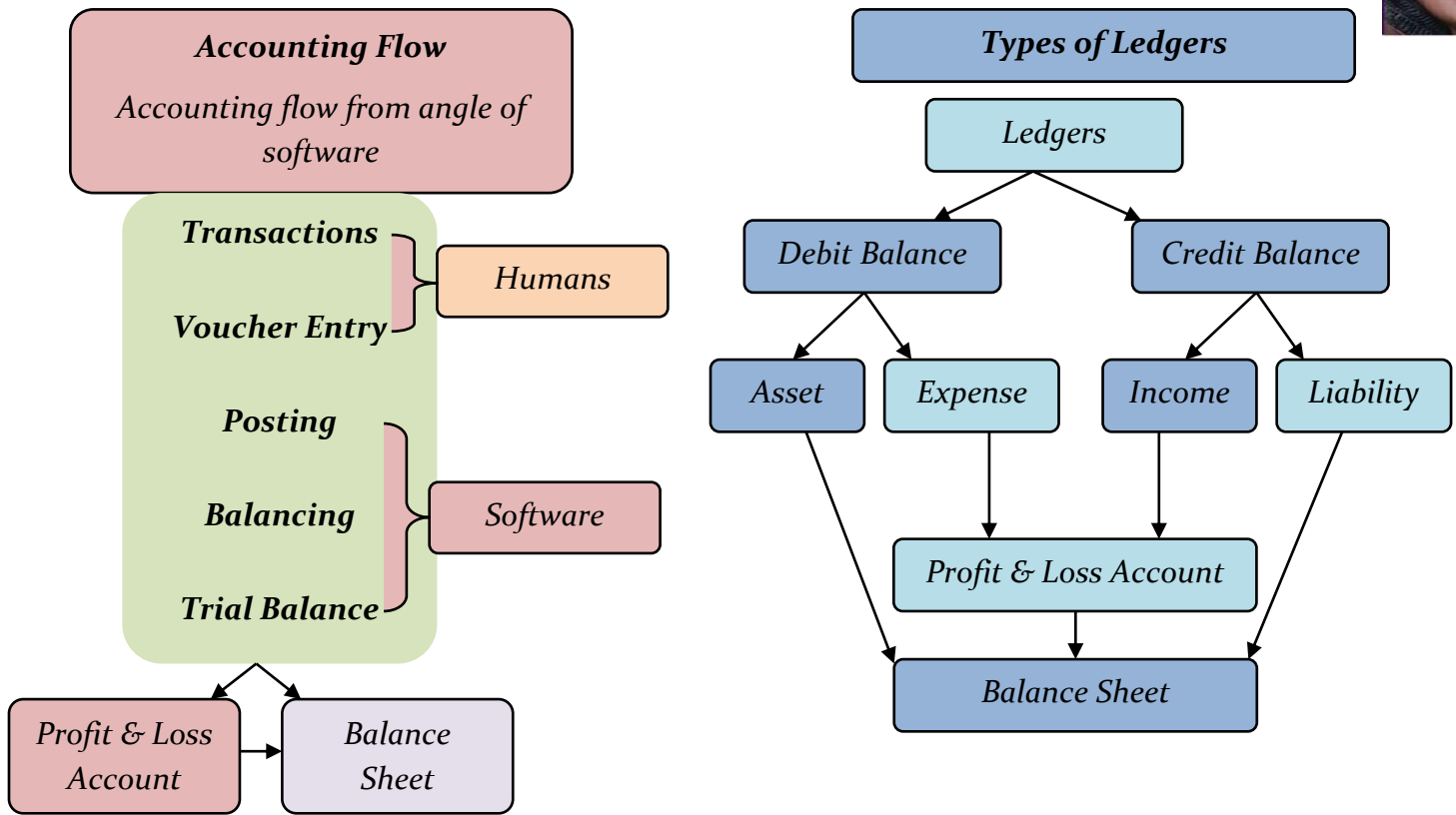
Types of vouchers used in accounting system



Voucher Number

A Voucher No. or a Document Number is a unique identify of any voucher/document.

- Peculiarities about voucher numbering**
- i) It must be unique
 - ii) Separate numbering series
 - iii) May have prefix or suffix or both
 - iv) All vouchers must be numbered serially
 - v) All vouchers are recorded in chronological order & hence voucher recorded earlier must have an earlier number



Grouping of Ledgers – At time of creation of any new ledger, it must be placed under a particular group
There are four basic groups in Accounting, i.e. Income, Expenses, Asset, Liability

Risks and Controls

A. Risks in an ERP Environment

- Risks can be summarized as under
- i) Physical safety of data.
 - Risk of total loss of data.
 - Risk of partial loss of data.
 - ii) Electronic safety of data.
 - Risk of unauthorized changes in data.
 - Risk of partial / complete deletion of data.
 - Risk of leakage of info.
 - Risk of incorrect input of data.

B. Risks associated & Controls required

- i) Data Access
- ii) Data Safety
- iii) Speed of Operation
- iv) Change in process
- v) Staff Turnover
- vi) System Failure





C. Role Based Access Control (RBAC)

- i) It is an approach to restricting system access to authorized users.
- ii) It is a policy neutral access control mechanism defined around roles & privileges.
- iii) RBAC can be used to facilitate administration of security in large organization.



D. Types of Access

While assigning access to different users, following options are possible:-

i) **Create** – Allows to create data.

ii) **Alter** – Allows to alter data.

iii) **View** – Allows only to view data.

iv) **Print** – Allows to print data.

Above type of access can be allowed / disallowed for :-

Master Data

Transaction Data

Reports

Audit of ERP Systems

- i) Fundamental objectives of an audit of controls do not change in an environment. When evaluating controls over systems, decisions must be made regarding relevance of operational internal control procedures to IT controls.
- ii) ERP Systems should produce accurate, complete, & authorized information that is supportable & timely.

Auditing aspects in case of any system can be summarized as under:-

- i) Auditing of Data (a) Physical Safety (b) Access Control
- ii) Auditing of Processes (a) Functional Audit (b) Input Validations.

Applicable Regulatory & Compliance Requirements

- i) Compliance means conforming to a rule, such as a specification, policy, standard or law.
- ii) Regulatory compliance describes goal that organizations aspire to achieve in their efforts to ensure that they are aware of & take steps to comply with relevant laws, policies & regulations.



Types

i) General – Applicable to all irrespective of anything.

ii) Specific – Applicable to specific type of businesses only.

There may be two approaches for making compliances requiring accounting data

i) Using same software for accounting & tax compliance.

ii) Using different software for accounting & tax compliance.

Business Process Modules & Their Integration Financial & Accounting Systems

Different types of industries require different modules these are as follows:-

1) Financial Accounting Module:

Features of this module:-

- a) Tracking of flow for effective strategic decision making.
- b) Creation of Organizational Structure.
- c) Financial Accounting Global Settings.
- d) General ledger Accounting.
- e) Tax Configuration & Creation & Maintenance of house of Banks.
- f) Asset Accounting.
- g) Account payables.
- h) Account receivables.
- i) Integration with Sales & Distribution &.....

2) Controlling Module: Features of this module:-

- a) Cost element Accounting.
- b) Cost Center Accounting.
- c) Activity-Based-Accounting.
- d) Internal Orders.
- e) Product Cost Controlling.
- f) Profitability Analysis.
- g) Profit Center Accounting.





3) Sales & Distribution Module:

Features of this module:-

- a) Setting up Organization Structure.
- b) Assigning Organizational Units.
- c) Defining pricing Components.
- d) Setting up sales document types, billing types, and tax-related components.
- e) Setting up Customer master data records & configuration.

Sales & Distribution Process

- a) Pre-Sales Activities.
- b) Sales Order.
- c) Inventory's Sourcing.
- d) Material Delivery.
- e) Billing.
- f) Receipt from Customer.

6) Material Management (MM) Module:

- a) Purchase Requisition from Production Dept.
- b) Evaluation of Requisition.
- c) Asking for Quotation.
- d) Evaluation of quotations.
- e) Purchase Order.
- f) Material Receipt.
- g) Issue of material.
- h) Purchase Invoice.
- i) Payment to Vendor.

4) Human Resource Module:

- i) Enhances work process & data management within HR dept of enterprises.
- ii) Most important objective of master data administration in Human Resources is to enter employee-related data for administrative, time recording, & payroll purposes. Payroll & personnel departments deal with Human Resource of organization.

5) Quality Management Module:

- a) Master data & standards are set for quality management.
- b) Set Quality Targets to be met.
- c) Quality management plan is prepared.
- d) Define how those quality targets will be measured.
- e) Take actions needed to measure quality.
- f) Identify quality issues & improvements & changes to be made.
- g) Any change is needed in product, change requests are sent.
- h) Report on overall level of quality achieved.
- i) Quality is checked at multiple points.



7) Project Systems Module:

i) It is an integrated project management tool used for planning & managing projects.

ii) It has several tools that enable project management process such as cost & planning budget, scheduling, requisitioning of materials and services.

8) Production Planning (PP) Module:

i) It is another important module that includes software designed specifically for production planning & management.

ii) It also consists of master data, system configuration and transactions in order to accomplish plan procedure for production.

9) Supply Chain Module:

It provides extensive functionality for logistics, manufacturing, planning, & analytics.

10) Plant Maintenance Module:

i) It is a functional module which handles maintaining of equipment & enables efficient planning of production & generation schedules.

ii) PM application component provides you with a comprehensive software solution for all maintenance activities that are performed within a company.

11) Customer Relationship Management (CRM): Benefits of a CRM module:-

- a) Improved customer relations.
- b) Increase customer revenues.
- c) Maximize up-selling & cross-selling.
- d) Better internal communication.
- e) Optimize marketing.



Reporting System & Management Information System

(A) Reporting System

- i) It simply means presentation of information in proper & meaningful way.
- ii) A system of regular reporting on pre-decided aspects.



(B) Management Information System (MIS)

i) What is an MIS Report?

It is a tool that managers use to evaluate business processes & operations.

ii) Who Uses MIS Reports?

- a) MIS systems automatically collect data from various areas within a business.
- b) These systems can produce daily reports that can be sent to key members throughout the organization.

iii) Type of Information in an MIS Report

- a) Relevant b) Timely c) Accurate d) Structured

What is a Business Process? – It consists of a set of activities that are performed in coordination in an organizational & technical environment.

Business Process Flow – Business Process is a prescribed sequence of work steps performed to produce a desired result for organization.

A typical life cycle of an accounting transaction may include:-

- (i) Source Document (ii) Journal (iii) Ledger (iv) Trial Balance
- (v) Adjustments (vi) Adjusted TB (vii) Closing Entries
- (viii) Financial statement



Business Process cycles in a manufacturing industry are depicted as under:-

- (i) Purchase & payables (ii) Production & Inventory
- (iii) Revenue & Receivables (iv) Fixed Assets
- (v) Payroll (vi) Financial Statement



Inventory Accounting Concepts

- i) Inventory stands for list of stock items intended for trading or consumption.
- ii) It includes raw material, work in process, finished goods & consumables.
- iii) All transactions involving inventory are covered in this module.

Different nature & types of businesses that are operated with purpose of earning profit

1--Trading Business

2--Manufacturing Business

3--Service Business

Integration with Other Modules

I) Integration Points – Some of points where integration with other modules is required are discussed here:-

- i) Material Management Integration with Finance & Controlling (FICO).
- ii) Human Resource Module Integration with Finance & Controlling.
- iii) Material Management Integration with Production Planning (PP)
- iv) Material Management Integration with Sales & Distribution (SD)
- v) Material Management Integration with Quality Management (QM)
- vi) Material Management Integration with Plant Maintenance (PM)

II) Example of ERP Modules

-
- i) Material Management Module.
- ii) Production Module.
- iii) Supply Chain Module.
- iv) Finance & Accounting.
- v) Human Resource Module.
- vi) Sales & Distribution.

Business Reporting & Fundamentals of XBRL



Business Reporting

It is public reporting of operating & financial data by a business enterprise, or regular provision of information to decision-makers within an organization to support them in their work.

Why is Business Reporting Important?

- I) Allows organizations to present a cohesive explanation of their business.
- II) Helps stakeholders to assess organizational performance & make informed decisions.
- III) Promote better internal decision-making.
- IV) Integral to successful management of business, & is one of major drivers of sustainable organizational success.



Fundamentals of XBRL

I. What is XBRL

i) It is open international standard for digital business reporting, managed by a global not for profit consortium, XBRL International.

ii) XBRL provides a language in which reporting terms can be authoritatively defined.

iii) It is a standards-based way to communicate & exchange business information between business systems.

II. What is XBRL tagging

It is process by which any financial data is tagged with most appropriate element in an accounting taxonomy that best represents data in addition to tags that facilitate identification/classification.

IV. Who uses it?

- i) Regulators
- ii) Companies
- iii) Governments
- iv) Data Providers
- v) Analysts & Investors
- vi) Accountants

III. What does XBRL do?

It allows unique tags to be associated with reported facts, allowing:

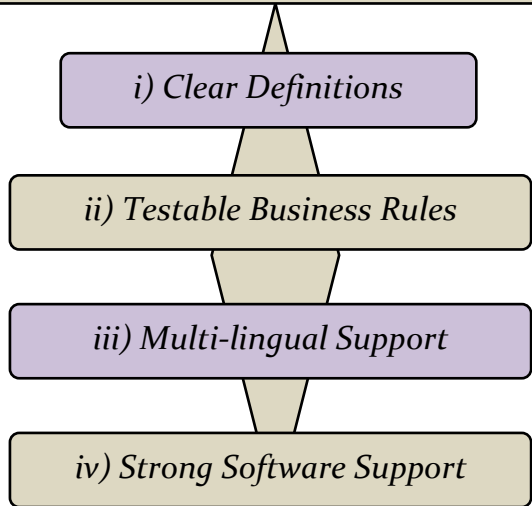
i) People publishing reports to do so with confidence that information contained in them can be consumed & analyzed accurately.

ii) People consuming reports to test them against a set of business & logical rules, to capture & avoid mistakes at their source.

iii) People using information to do so in the way that best suits their needs, including by using different languages, alternative currencies & in their preferred style.

iv) People consuming information to do so confident that data provided to them conforms to a set of sophisticated pre-defined definitions.

V. Important features of XBRL





Data Analytics And Business Intelligence

Data Analytics

- i) Data Analytics is process of examining data sets to draw conclusions about information they contain, increasingly with aid of specialized systems & software.*
- ii) It's initiatives can help businesses increase revenues, improve operational efficiency, optimize marketing campaigns & customer service efforts, respond more quickly to emerging market trends & gain a competitive edge over rivals.*

Types of Data Analytics Applications

- i) Data Analytics can also be separated into quantitative data analysis & qualitative data analysis.*
- ii) More advanced types of data analytics include data mining, which involves sorting through large data sets to identify trends, patterns & relationships.*

Inside Data Analytics Process

- i) It involve more than just analyzing data.*
- ii) Analytics process starts with data collection, in which data scientists identify information they need for a analytics application & then work on their own or with data engineers & IT staffers to assemble it for use.*
- iii) Once data that's needed is in place, next step is to find & fix data quality problems that could affect accuracy of analytics applications.*



Business Intelligence (BI)

- i) It is a technology-driven process for analyzing data & presenting actionable information to help corporate executives, business managers & other end users make more informed business decisions.*
- ii) Potential benefits of business intelligence programs include:-*
 - a) Accelerating & improving decision making.*
 - b) Optimizing internal business processes.*
 - c) Increasing operational efficiency.*
 - d) Driving new revenues*
 - e) Gaining competitive advantages over business rivals.*
- iii) BI data can include historical information, as well as new data gathered from source systems as it is generated, enabling BI analysis to support both strategic & tactical decision-making processes.*



CHAPTER - 3

Information Systems and ITS Components

(1) (A) Information :-

- i) Data is a raw fact & can take form of a number or statement such as a date or a measurement.
- ii) Information involves collecting data & then subjecting them to a transformation process in order to create information.

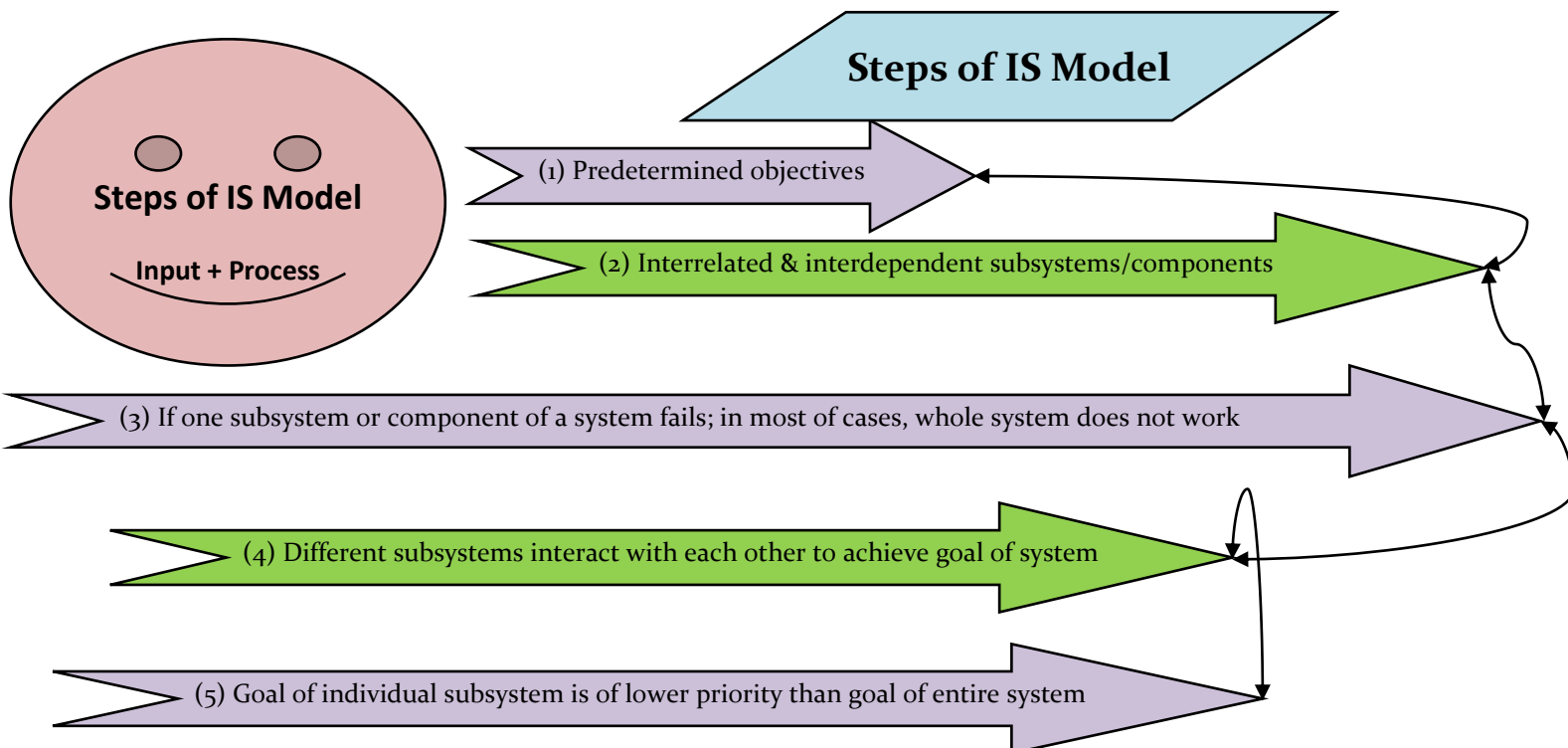
(B) SYSTEM

A group of mutually related, cooperating elements with a defined boundary; working on reaching a common goal by taking inputs & producing outputs in organized transformation process.



(A) INFORMATION SYSTEM

IS is a combination of people, hardware, software, communication devices, network & data resources that processes (can be storing, retrieving, transforming information data & information for a specific purpose





(3)

Components of Information Systems

Networking & Communication Systems

Computer Network

It is a collection of computers & other hardware interconnected by communication channels that allow sharing of resources & information.

Network & Communication System

These consist of both physical devices & software, links various pieces of hardware & transfers data from one physical location.....

Issues

Routing,

Bandwidth,

Resilience,

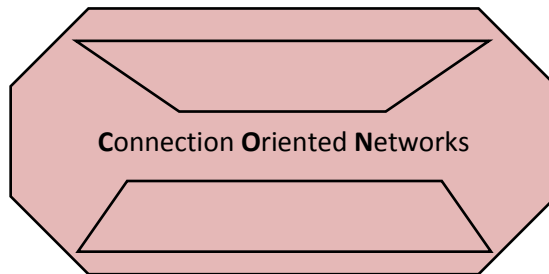
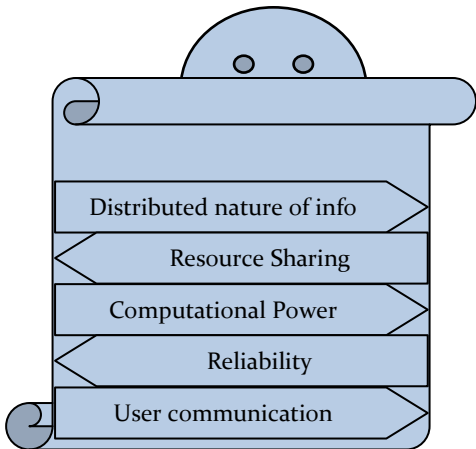
Contention

Impacts

Time compression

Overcoming geographical dispersion

Restructuring business relationships



Network Related Concepts	(1) Packet	(7) Router	(13) Domain Name System
	(2) Repeater	(8) Network Topology	(14) Packet Switching
	(3) Hub	(9) Transmission Mode	(15) Wi-Fi
	(4) Bridge	(10) Protocol	(16) Voice Over IP (VoIP)
	(5) MAC Address	(11) IP Address	
	(6) Switch	(12) Domain Name	



(4) Components of Information Systems

(A) PEOPLE RESOURCES

People are most Important element in most computer-based information systems. People involved include users of system & information systems personnel, including all people who manage, run, program, & maintain system.

(B) DATA RESOURCES



(1) DATA

Data are raw bits & pieces of Information with no context. It can be quantitative or qualitative. Quantitative data is numeric, result of a measurement, count, or some other mathematical calculation. Qualitative data is

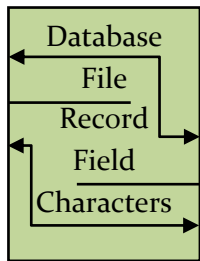
(2) DATABASE

It is an organized collection of related information. In a database all data is described & associated with other data.

(3) DATABASE MODELS

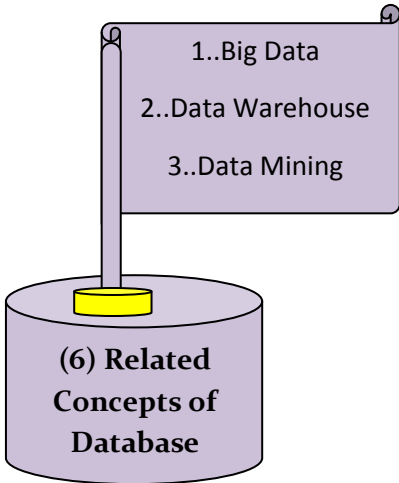
It is a type of data model that determines logical structure of a database & fundamentally determines in which manner data can be stored, organized & manipulated.

(4) Hierarchy of database



(5) Database models

- Hierarchical Database Model
- Network Database Model
- Relational Database Model
- Object Oriented Database



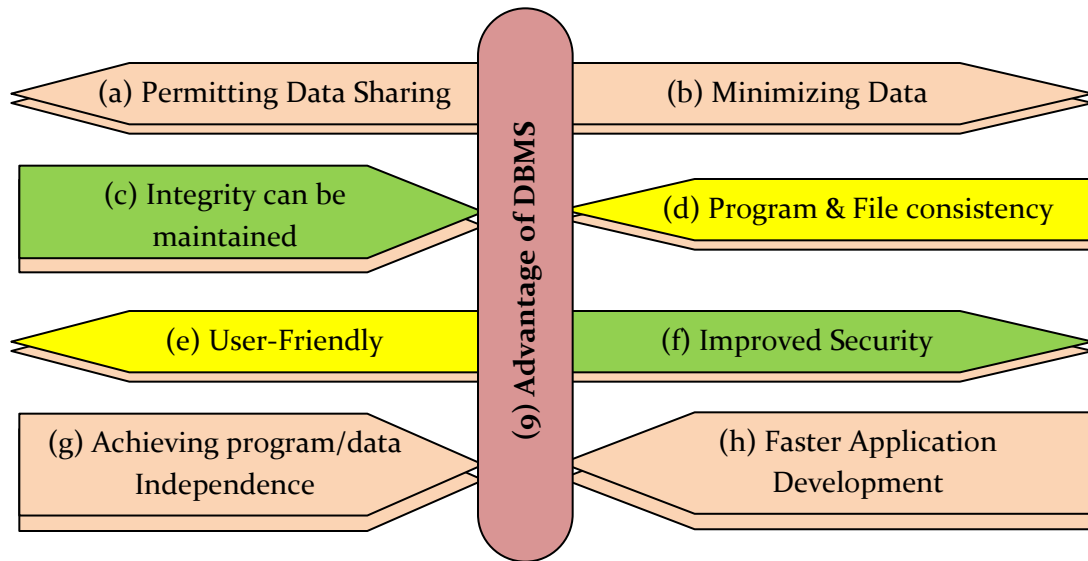
(7) Database Management Systems (DBMS) :

It is a software that aid in organizing, controlling & using data needed by application programme.



(8) Operations Performed by :

- a) Adding new files to
- b) Deleting existing files from Database
- c) Inserting data in existing
- d) Modifying data in existing
- e) Deleting data in existing
- f) Retrieving or querying data from existing files



(c) Information System's Control

Need for Controls in IS

- ✓ Information integrity, reliability & validity for timely flow of accurate information throughout org.
- ✓ To reduce probability of organizational costs of data loss, computer loss, computer abuse, incorrect decision making & to maintain
- ✓ Safeguarding assets to maintain accurate data readily available.

Impact of Technology on Controls

- Competent & Trustworthy Personnel
- Segregation of Duties



Objectives of Controls

Categories of Exposures

Critical control lacking in a computerized environment

- ❖ Errors or omissions in data, procedures, processing, judgment &
- ❖ Improper authorizations & Improper accountability.
- ❖ Inefficient activity in procedures, processing & comparison.

- ❖ Lack of management understanding of IS risks & related controls.
- ❖ Absence or inadequate IS control framework.
- ❖ Absence of week general controls & IS controls.
- ❖ Lack of awareness & knowledge of IS risks & controls amongst business users & even IT staff.
- ❖ Complexity of Implementation.
- ❖ Lack of control features or their implementation in highly technology driven environments.
- ❖ Inappropriate technology implementations or inadequate security functionality in technologies implemented.



Purpose Served by Control Objectives

- Outline policies of org. as laid down by management.
 - Benchmark for evaluating whether control objectives are most

(d) Components of Information Systems

Hardware It is tangible portion of our computer systems; something we can touch & see.

Input Devices: - Through which we interact with systems & include devices like keyboard, Mouse & other pointing devices, Scanners.



PROCESSING DEVICES

Include computer chips that contain Central Processing Unit & Main

IT CONSISTS OF THREE FUNCTIONAL UNITS

Control Unit (CU)

Arithmetic & Logical Unit (ALU)

Registers

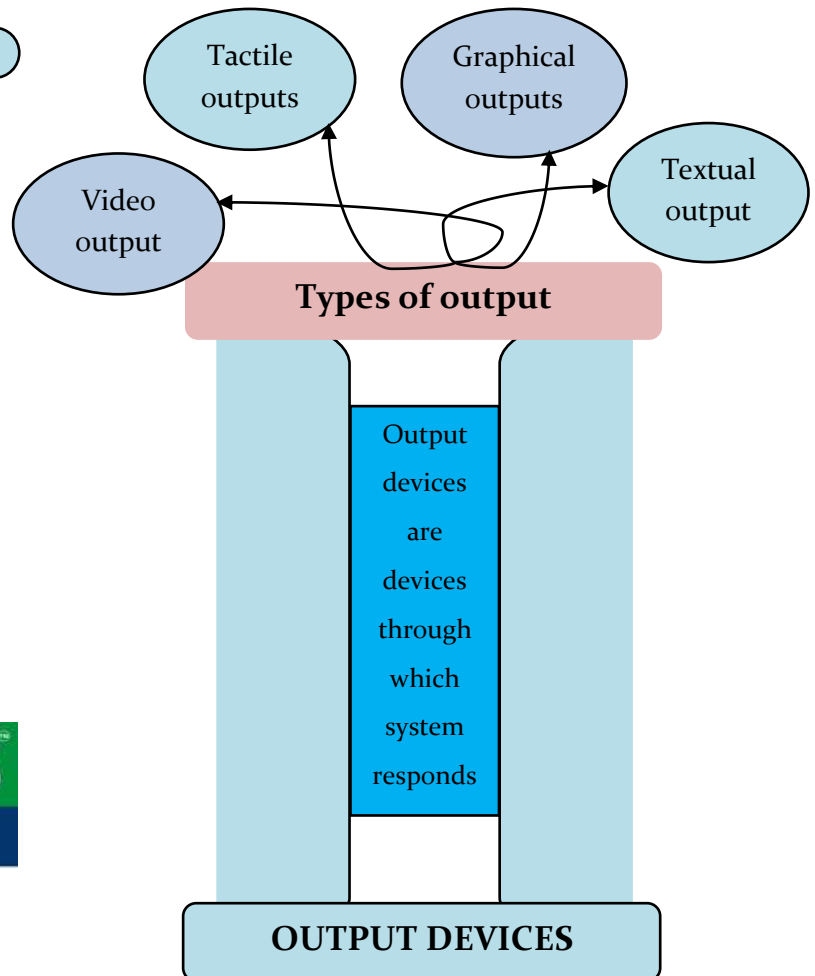
- i) Accumulators
- ii) Address Registers
- iii) Storage Registers
- iv) Miscellaneous

DATA STORAGE DEVICES

Memory where data & programs are stored

Types of memory techniques/devices

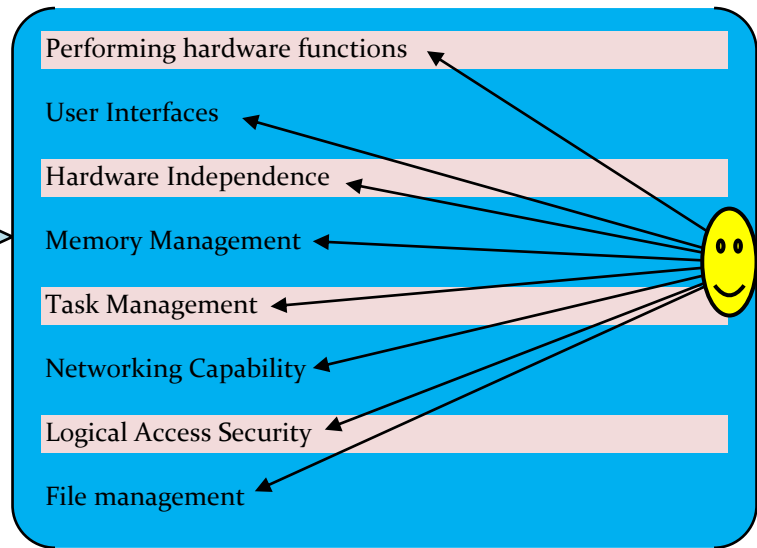
- i) Internal Memory
 - ✓ Internal Memory
 - ✓ Cache Memory
- ii) Primary Memory/Main Memory
 - ✓ Random Access Memory
 - ✓ Read Only Memory
- iii) Secondary Memory
- iv) Virtual Memory





	Operating Systems Software
	It is a set of computer programs that manages computer hardware resources & acts as an Interface with computer applications programs.

Activities are executed by OS



APPLICATION SOFTWARE
It includes all that computer software that cause a comp. to perform useful tasks beyond running of comp. itself.

- TYPES
- Application Suite
 - Enterprise Software
 - Enterprise Infra. Software
 - Information Worker Software
 - Content Access Software
 - Educational Software
 - Media Development Software

Disadvantages :
Development is costly Infection from Malware

Benefits :
Addressing User needs / Less threat from virus / Regular updates

Application Areas :

- Finance & Accounting Marketing & Sales
- Production or Mfg. Inventory / Stores Mgmt
- Human Resource Mgmt



(e) Classification of Information System's Controls

Objective of Controls

(1) **Preventive Controls** – These controls prevent errors, omissions, or security incidents from occurring

(2) **Detective Controls** – These controls are designed to detect errors, omissions or malicious acts that occur & report occurrence.

CHARACTERISTICS

- i) Clear understanding of lawful activities
- ii) Established mechanism to refer reported unlawful activities to appropriate person or group.
- iii) Interaction with preventive control to prevent such acts from occurring.
- iv) Surprise checks by supervisor

(3) **Corrective Controls** – It is desirable to correct errors, omissions, or incidents once they have been detected.



CHARACTERISTICS

- i) Minimizing impact of threat.
- ii) Identifying cause of problem.
- iii) Providing remedy to problems discovered by detective controls.
- iv) Getting feedback from preventive & detective controls.
- v) Correcting error arising from a problem.
- vi) Modifying processing systems to minimize future occurrences of incidents.



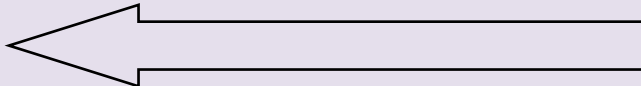
Nature of Information System

1) **ENVIRONMENTAL CONTROLS** – Controls relating to IT environment.



- Fire Damage
- Power Spikes
- Waster Damage
- Pollution Damage & others

2) **Physical Access Controls** – This includes abuse of data processing resources.



- i) Locks on Doors
- ii) Physical Identification Medium
- iii) Logging on Facilities
- iv) Other means of Controlling

Physical Access

- a) Video Cameras
- b) Security Guards
- c) Controlled Visitor Access
- d) Bonded Personnel
- e) Dead man Doors
- f) Non-Exposure of Sensitive

Facilities

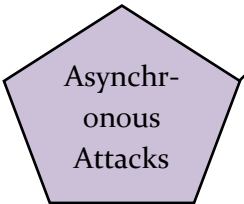
- g) Computer Terminal Looks
- h) Controlled Single Entry Point
- i) Alarm System
- j) Perimeter Fencing
- k) Control of out of hours of employee employees.
- l) Secured Report/Document Distribution cart.

3) **Logical Access Controls**

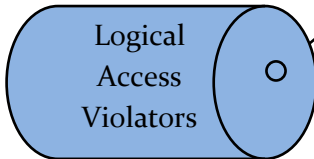
These are controls relating to logical access to information resources



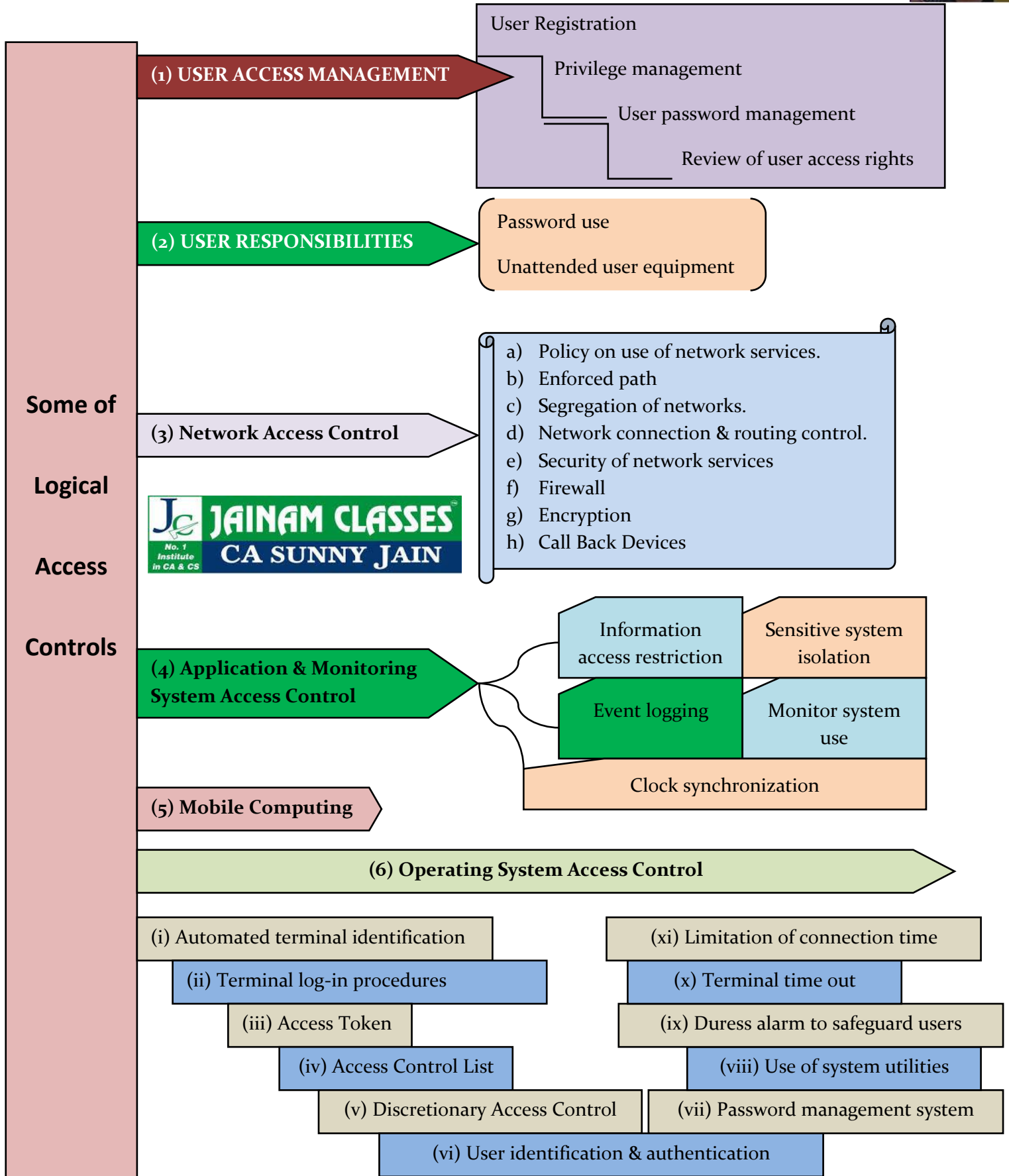
- Data Didding,
- Bomb,
- Christmas Card,
- Worm,
- Rounding Down,
- Salami Techniques,
- Trap Doors,
- Spooning.



- Data Leakage
- Subversive Attacks
- Wire tapping
- Piggybacking

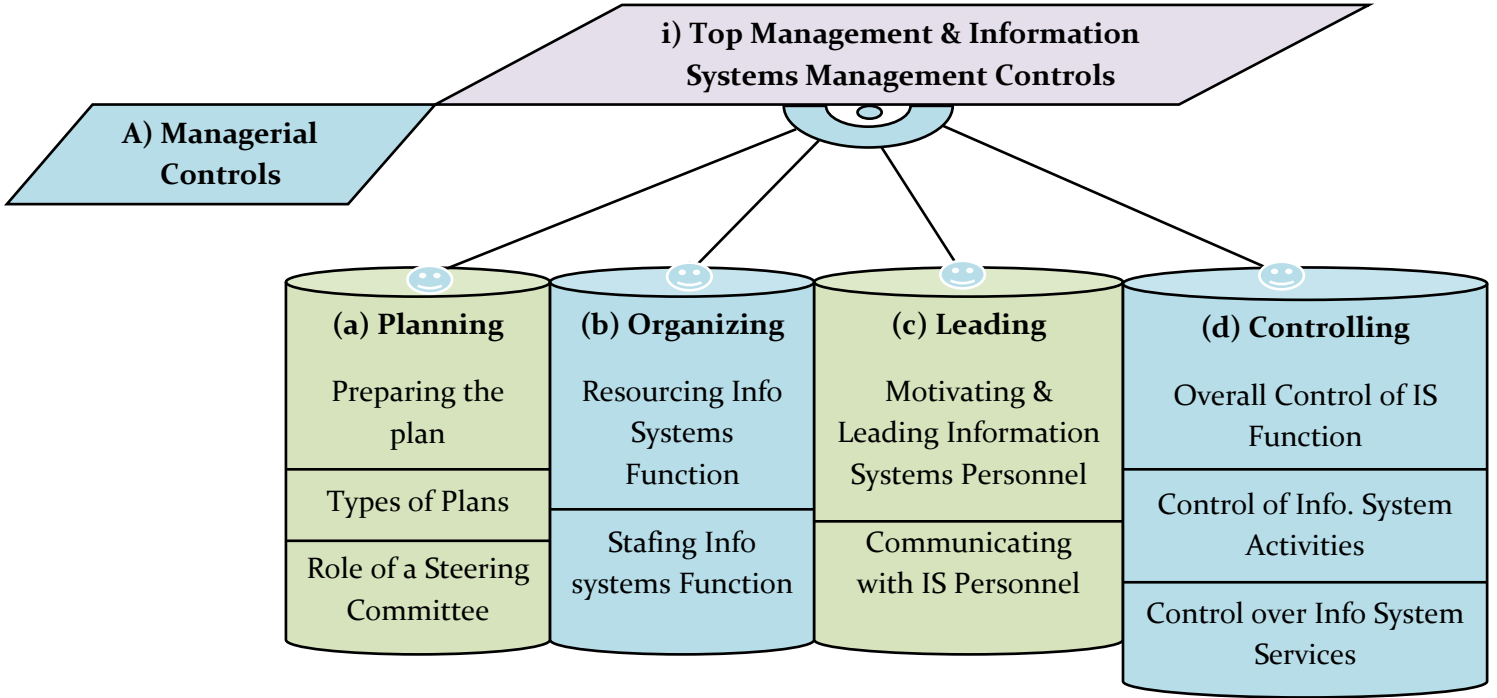


- Hackers
- Employees
- IS Personnel
- Former Employees
- End Users

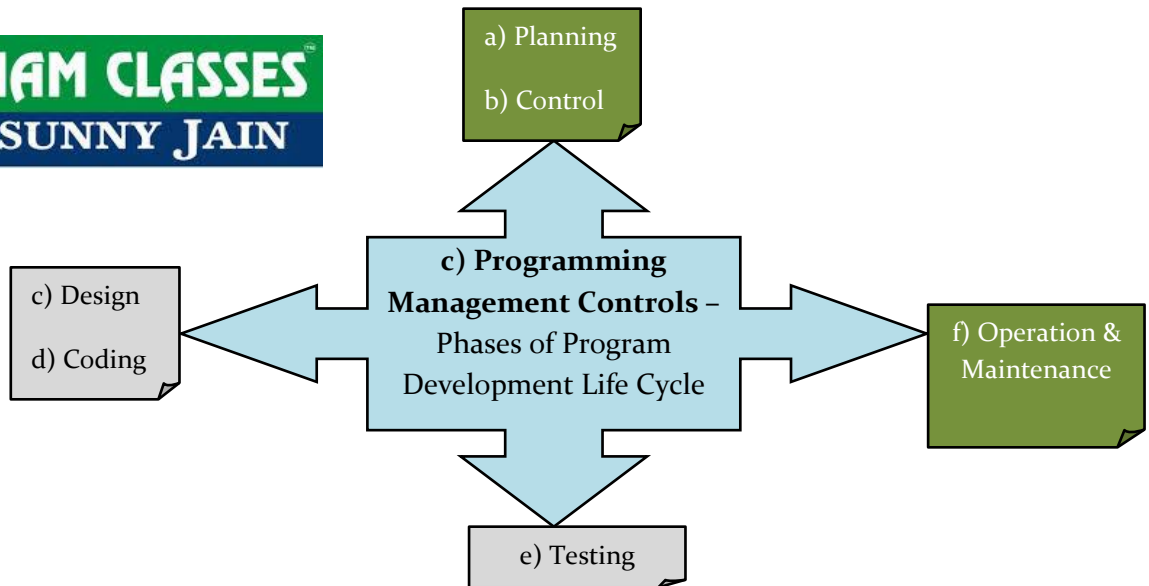


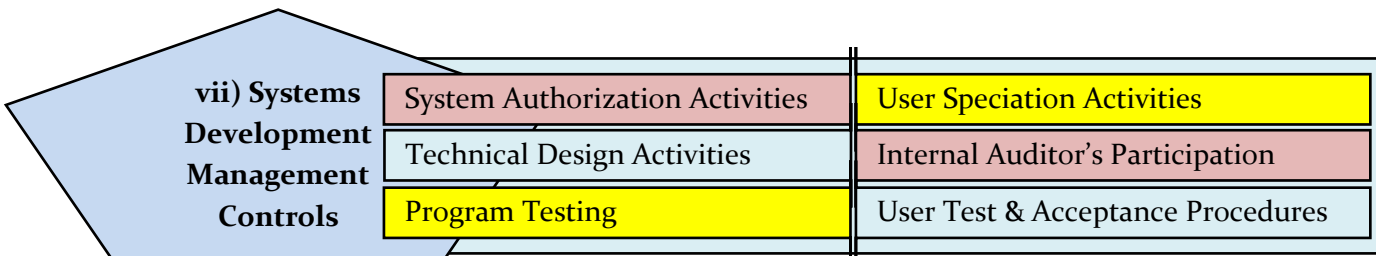
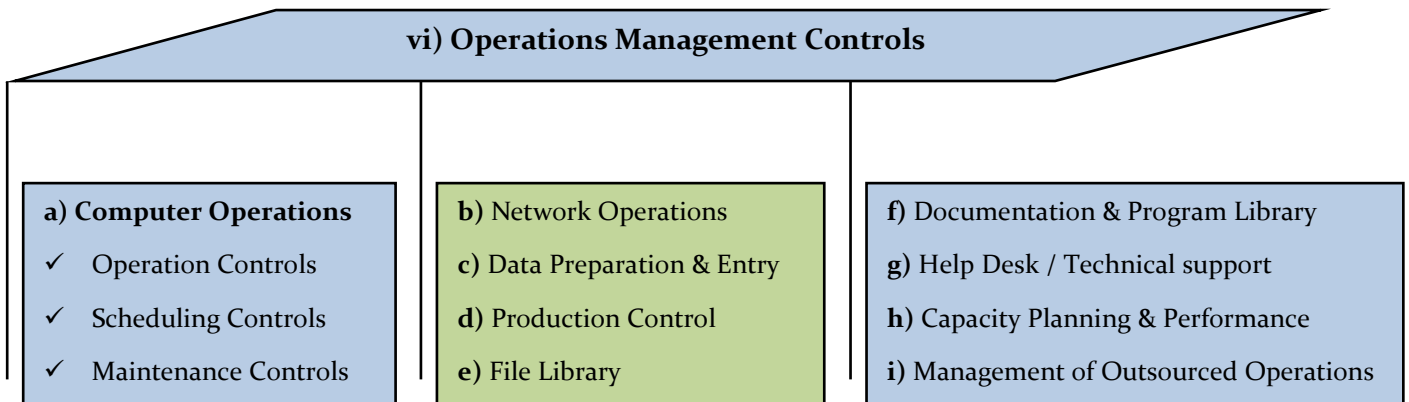
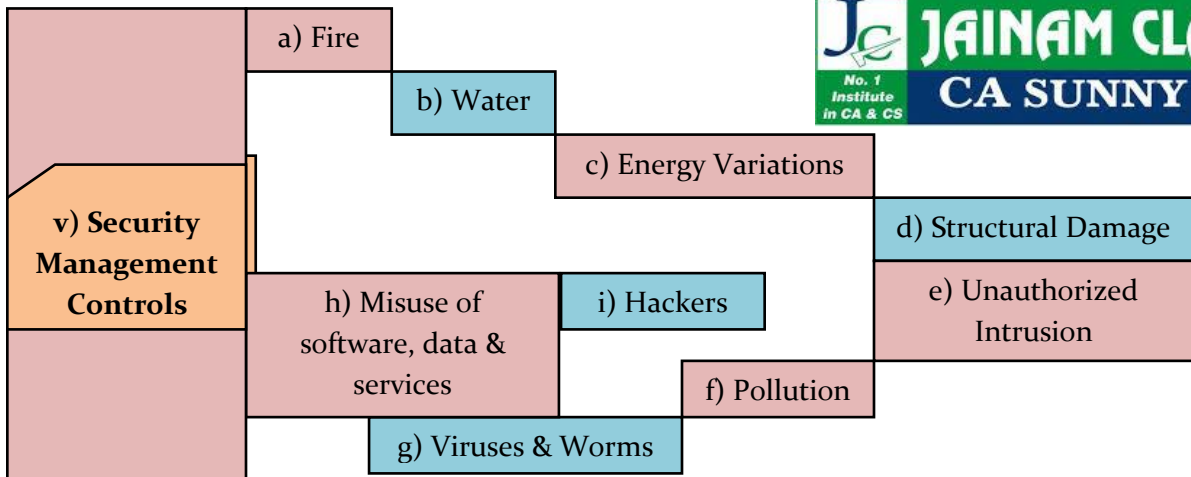
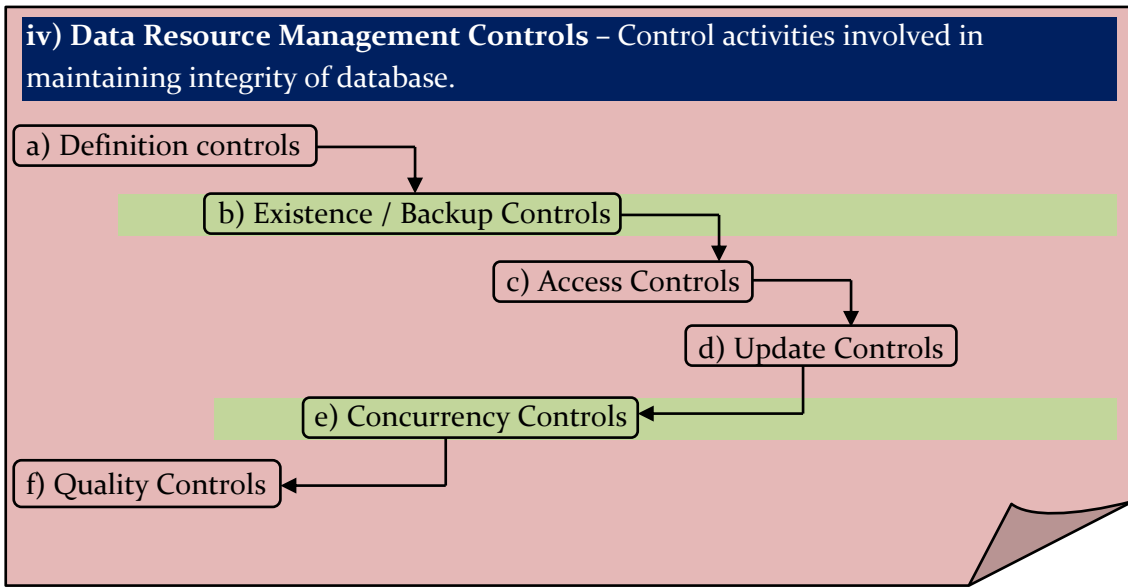


Audit Functions



ii) Quality Assurance Management Controls







B) Application Controls & their Categories

I) Boundary Controls

- a) Major purposes of access control mechanisms
 - Identification
 - Authentication
 - Authorization
- b) Cryptography
- c) Passwords
- d) Personal Identification Numbers (PIN)
- e) Identification Cards
- f) Biometric Devices

II) Input Controls

a) Source Document Controls

- Use Pre-numbered source documents
- Use source documents in sequence
- Periodically audit source documents

b) Data Coding Controls

i) Transcription errors

- Addition errors
- Truncation errors
- Substitution errors

ii) Transposition Errors

- Single transposition
- Multiple transposition

c) Batch Controls

i) Types of batches

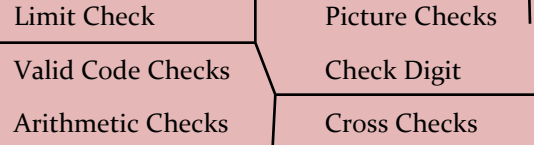
- Physical Controls
- Logical Controls

ii) Types of Control

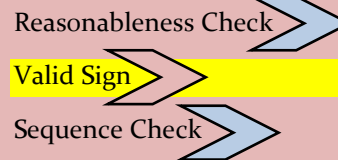
- Financial totals
- Hash totals
- Documents/Record Counts

d) Validation Controls

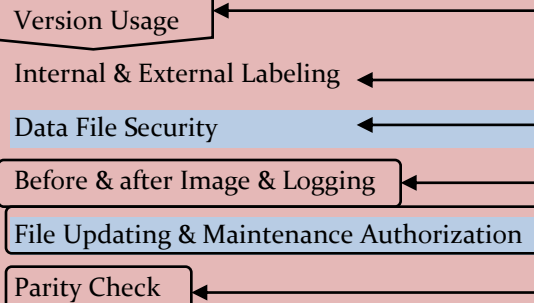
i) Field Interrogation



ii) Record Interrogation

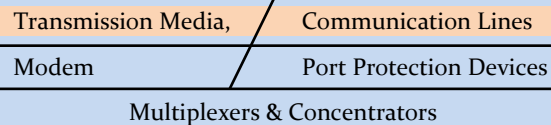


iii) File Interrogation



III) Communication Controls

i) Physical Component Controls



ii) Line Error Control



iii) Flow Controls

iv) Link Controls

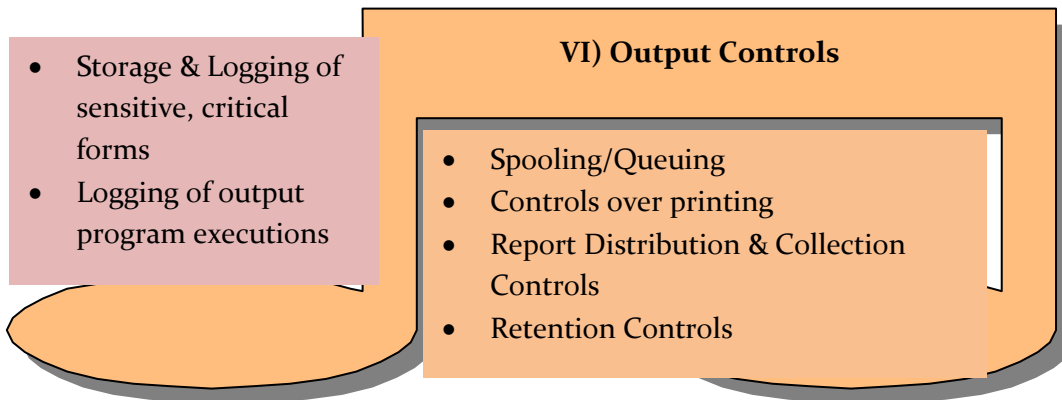
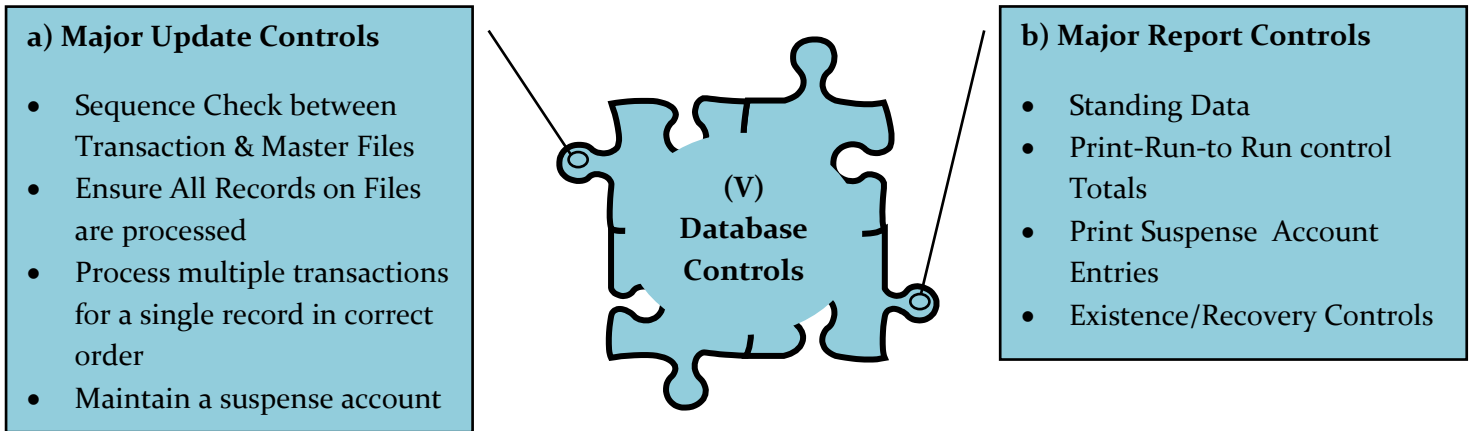
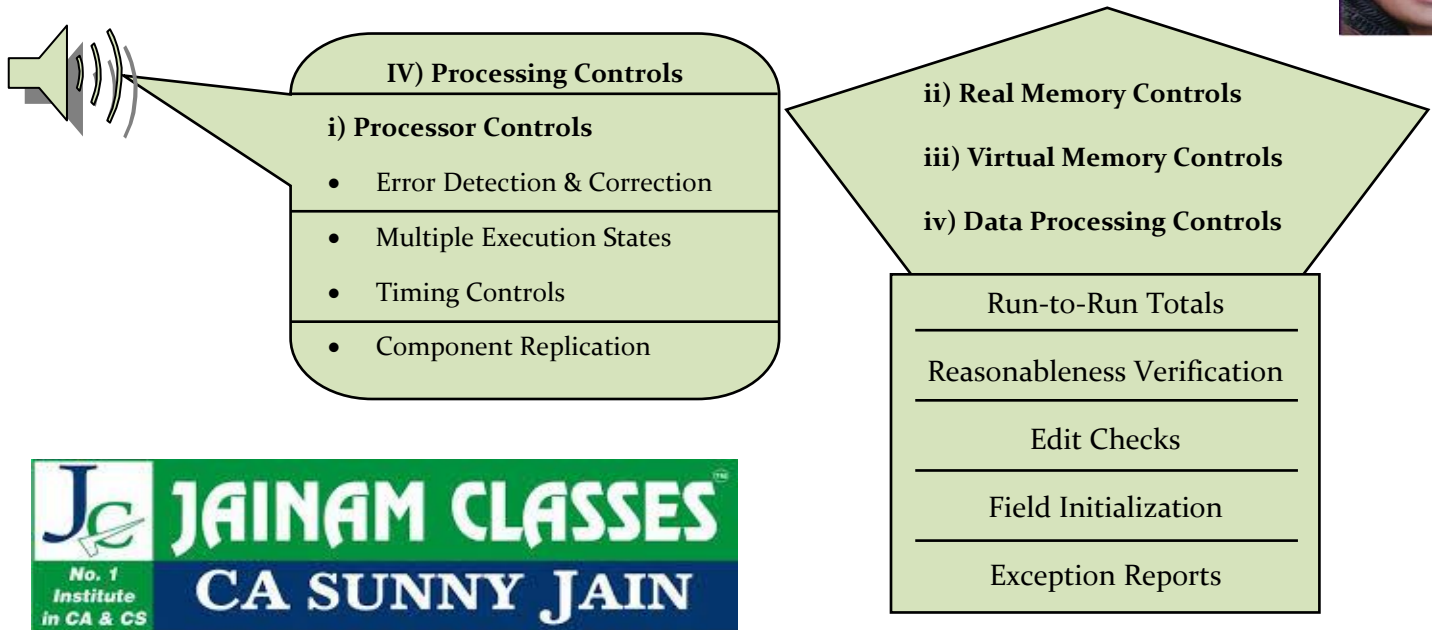
v) Topological Controls

- Local Area Network Topologies
- Wide Area Network Topologies

vi) Channel Access Controls

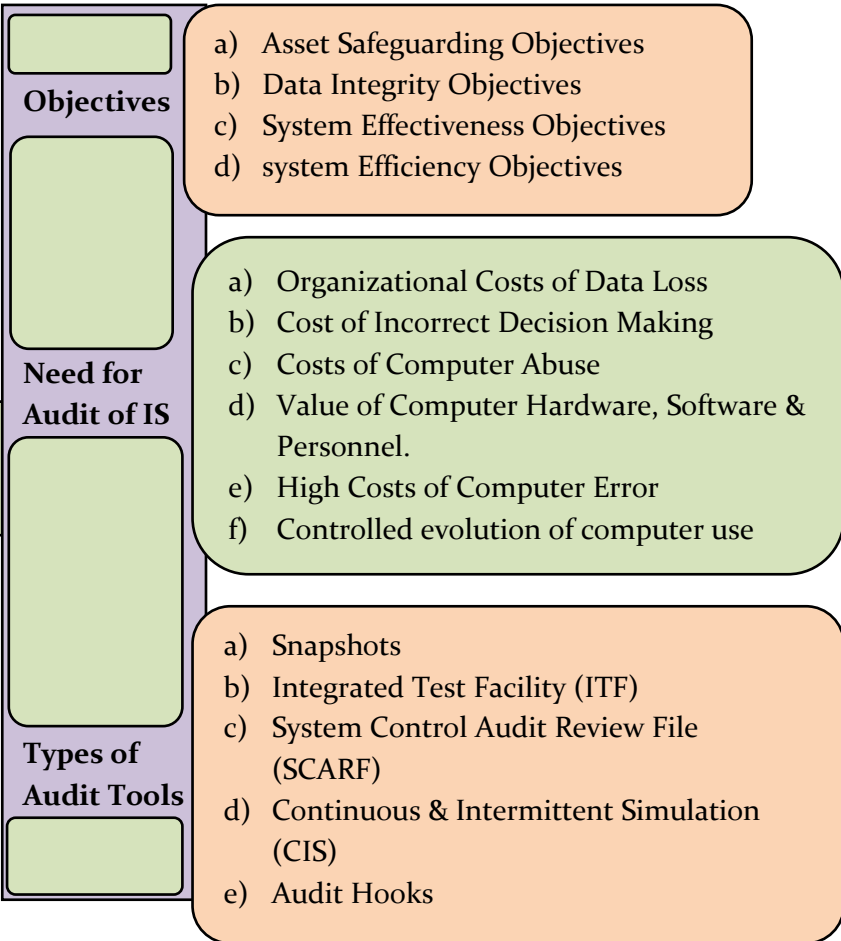
- Polling
- Contention Methods

vii) Internetworking Controls





Information System Auditing

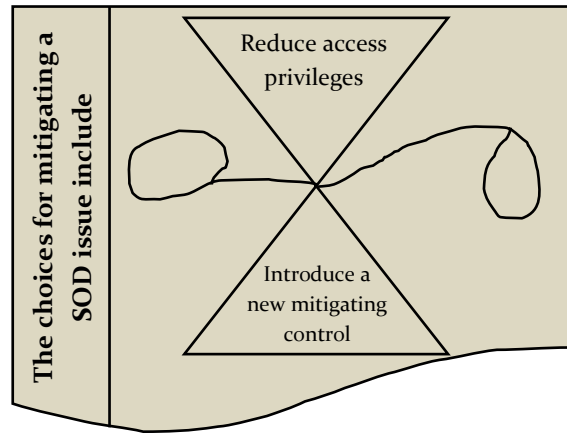
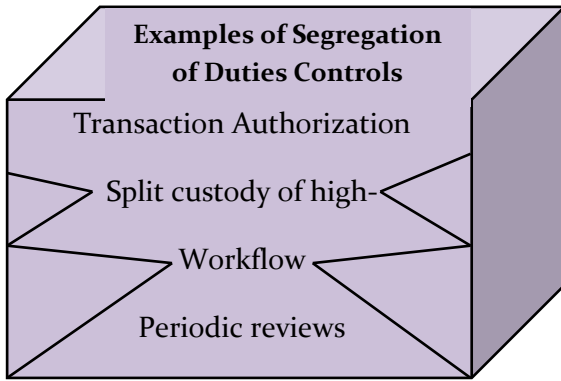


- IS AUDIT & AUDIT EVIDENCE**
- ✓ Means of controlling current audit work.
 - ✓ Evidence of audit work performed.
 - ✓ Schedules supporting or additional item in accounts.
 - ✓ Information about business being audited, including recent history.

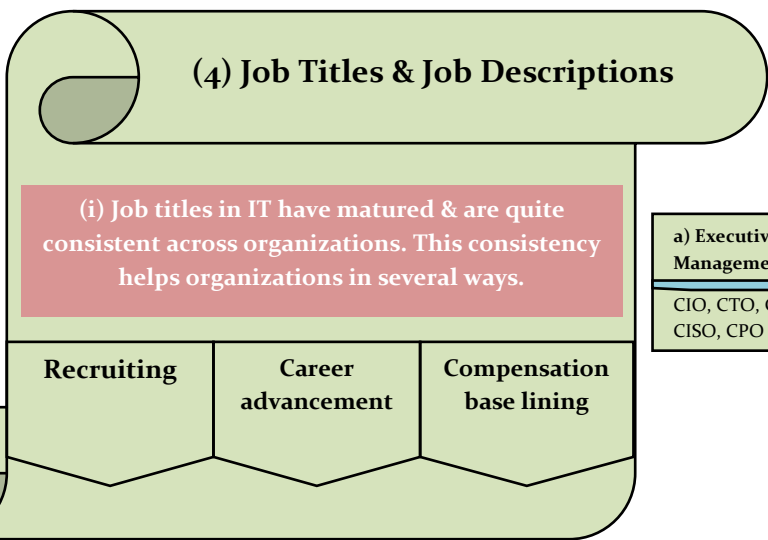
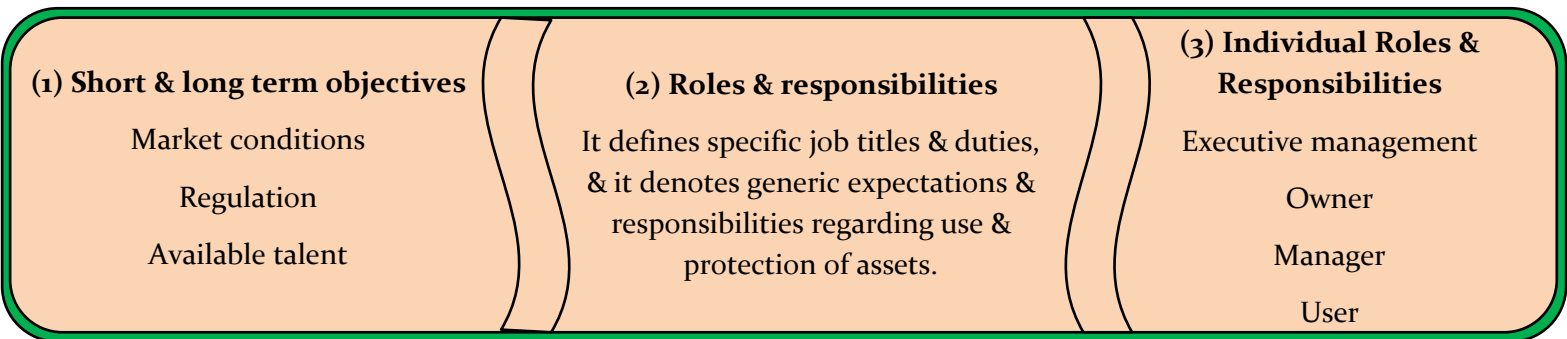
- INHERENT LIMITATIONS OF AUDIT**
- ✓ Nature of financial reporting.
 - ✓ Nature of audit procedures.
 - ✓ Need for audit to be conducted within a reasonable period of time & at a reasonable cost.
 - ✓ Matter of difficulty, time, or cost involved is not in itself a valid basis for auditor.
 - ✓ Fraud, particularly fraud involving senior management or collusion.
 - ✓ Existence & completeness of related party relationships & trans.
 - ✓ Occurrence of non-compliance with laws & regulations.
 - ✓ Future events or conditions that may cause an entity to cease to continue as a going concern.

SEGREGATION OF DUTIES

It ensures that single individuals do not possess excess privileges that could result in unauthorized activities such as fraud or manipulation or exposure of sensitive data.



Organizations Structure & Responsibility



(ii) Additional titles such as district manager, group manager, or area manager

- a) Executive Management**
CIO, CTO, CSO, CISO, CPO
- b) Software Development**
Systems architect
Systems Analyst
Software Developer, Programmer
Software Tester
- c) Data management**
Database Architect
Database administrator (DBA)
Database Analyst

- (d) Network Management**
Network Architect
Network Engineer
Network Administrator
Telecom Engineer
- (e) Systems Management**
Systems Architect
Systems Engineer
Storage Engineer
Systems Administrator
- (f) General Operations**
Operations Manager
Operations Analyst
Controls Analyst
Systems Operator
Data Entry
Media Librarian
- (g) Security Operations**
Security Architect
Security Engineer
Security Analyst
User Account Management
Security Auditor



Audit Trail

AUDIT TRAIL OBJECTIVES

- Detecting Unauthorized Access
- Reconstructing Events
- Personal Accountability

Auditing Environmental Controls

(1) Role of Auditor in Auditing Environmental Controls
 (2) Audit of Environmental Controls

- i) Power conditioning
- ii) Backup power
- iii) Heating, Ventilation, & Air Conditioning (HVAC)
- iv) Water detection
- (v) Fire detection & suppression
- vi) Cleanliness

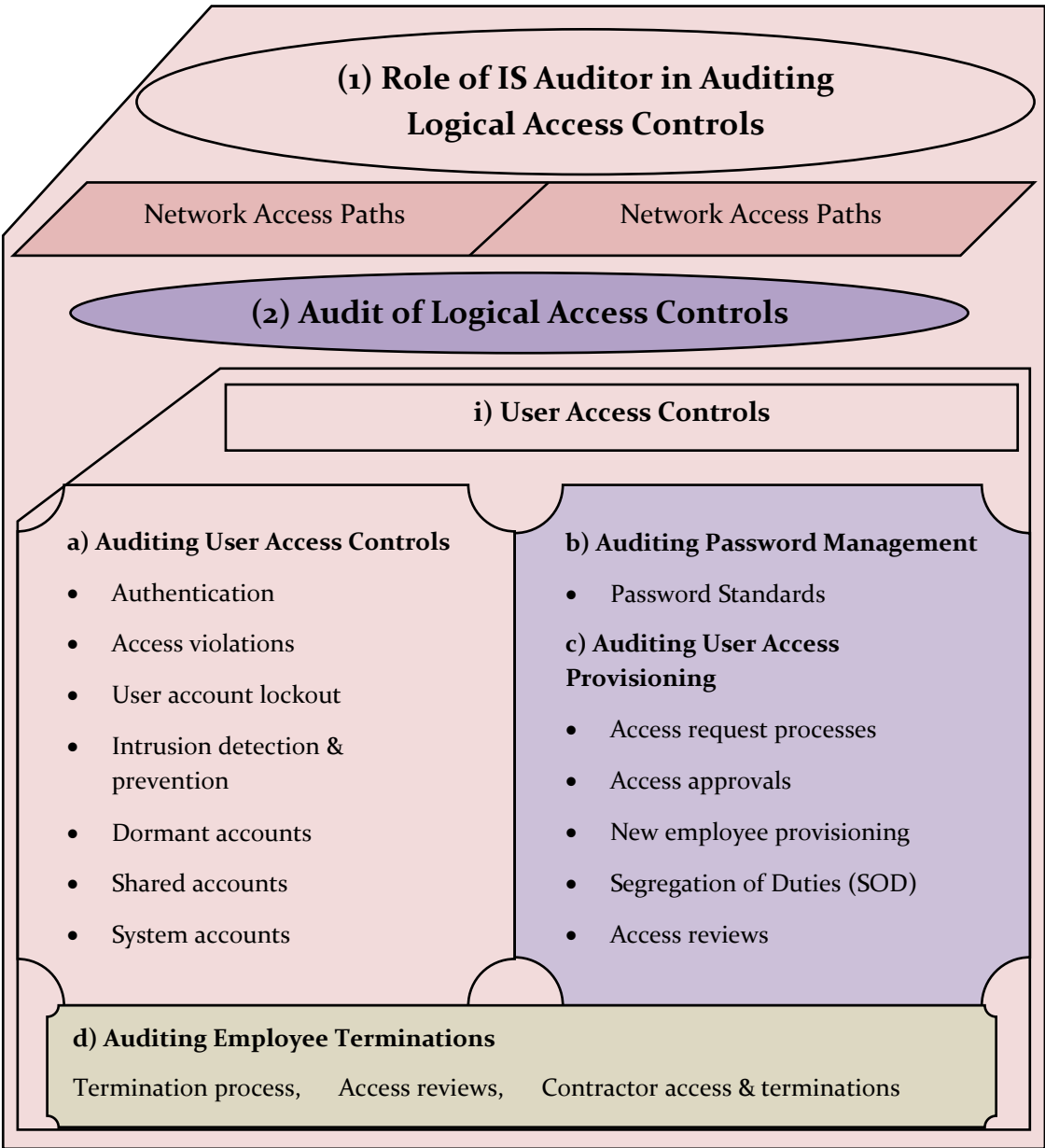
Auditing Physical Security Controls

i) Role of IS Auditor in Auditing Physical Access Controls

- Risk Assessment
- Controls Assessment
- Review of Documents

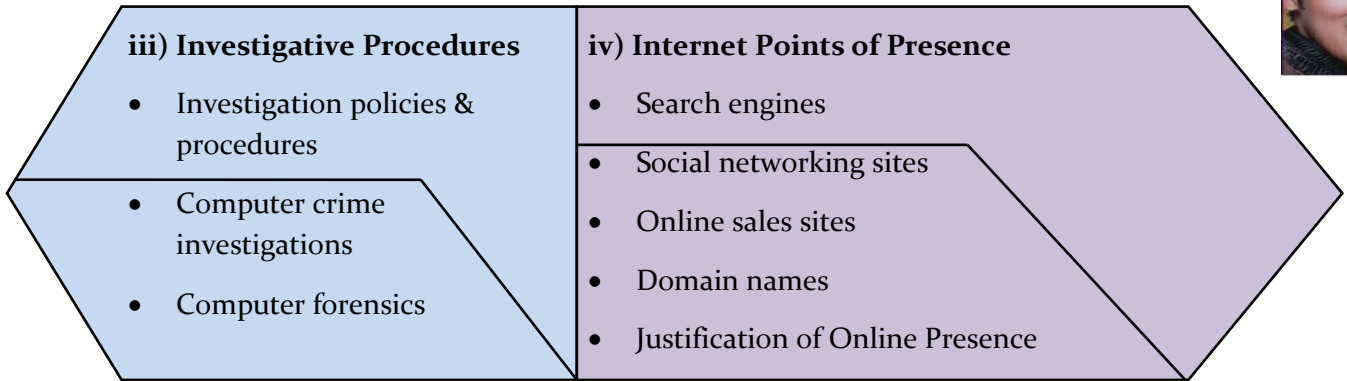
ii) Audit of Physical Access Controls

- Siting & Marking
 - ✓ Proximity to hazards
 - ✓ Marking
- Physical barriers
- Surveillance
- Guards & dogs
- Key-card systems

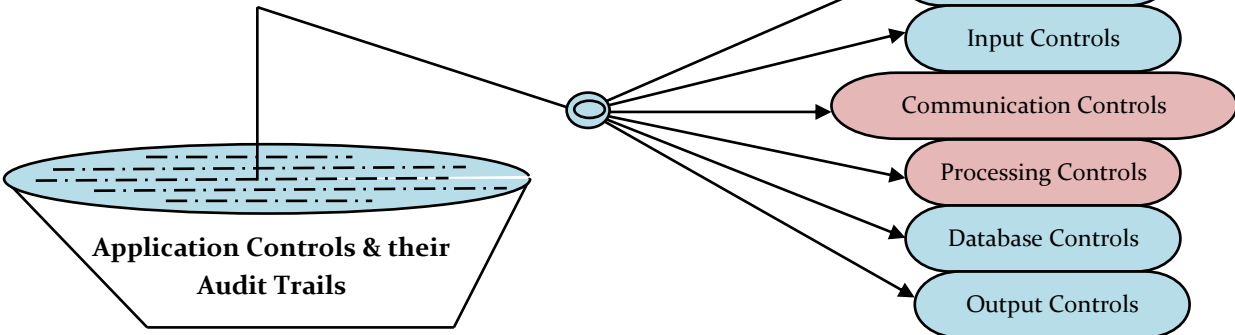
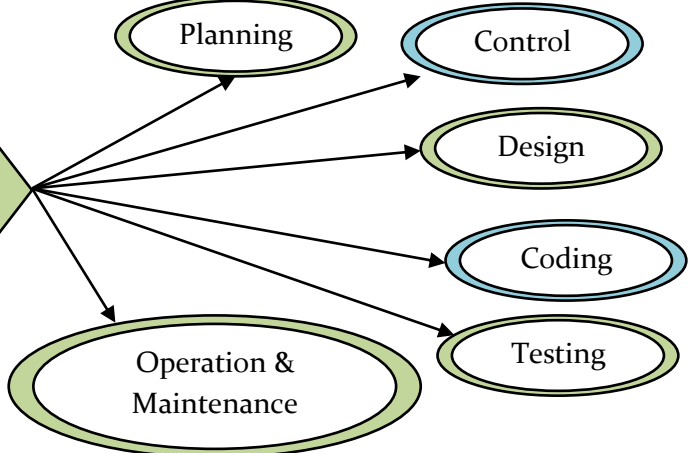
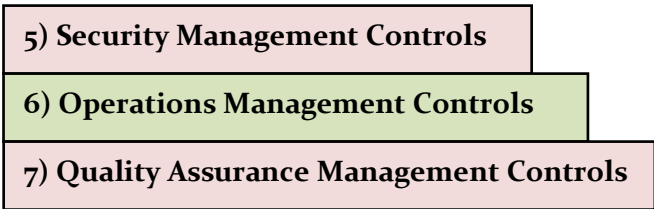
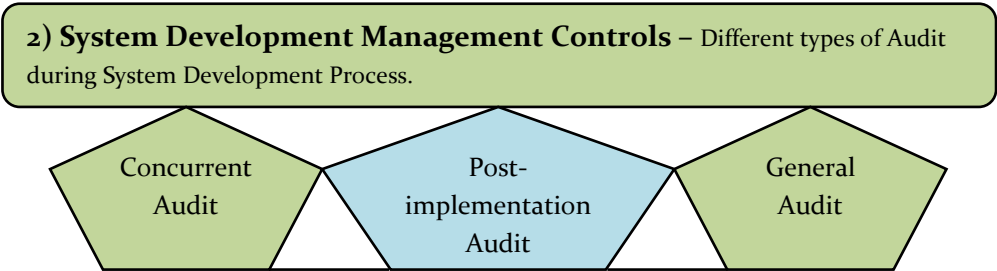
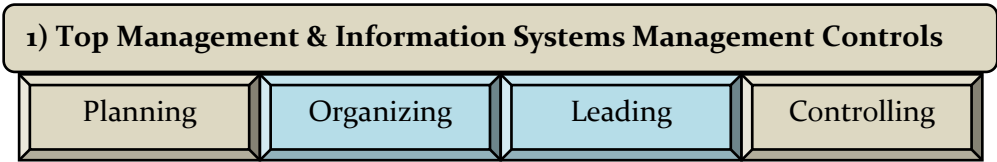


ii) User Access Logs

- Centralized access logs
- Access log protection
- Access log review
- Access log retention



Managerial Controls & their Audit Trails





CHAPTER - 4
E-Commerce, M-Commerce and Emerging Technology

Part of E-Commerce

(1) INTRODUCTION

“Sale/Purchase of goods/services through electronic mode is e-commerce.” This could include use of technology in form of Computers, Desktops, Mobile Applications, etc.

(2) Difference between Traditional commerce & E-commerce

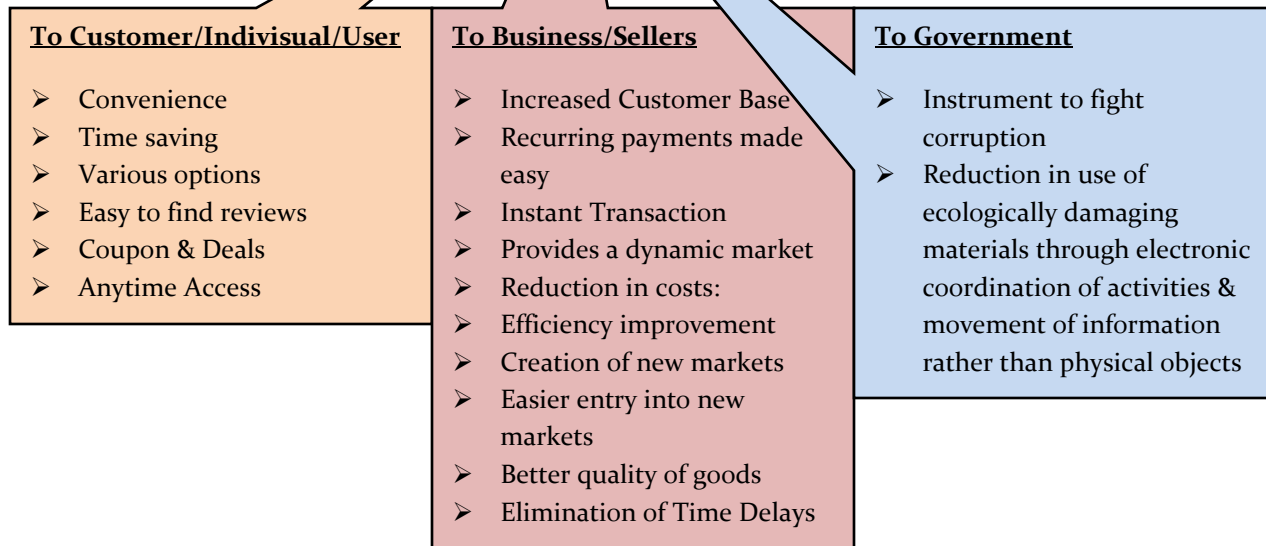
1-Includes all those activities which encourage exchange, in some way or other of goods/services which are manual & non-electronic	2-Transaction Processing Manual	3-Availability for commercial transactions For limited time	4-Goods can be inspected physically before purchase
5-Face-to-face Customer interaction	6-Business Scope Limited to particular area	7-No uniform platform for exchange of information	8-One way marketing
			9-Instant Delivery of goods



1-It means carrying out commercial transactions or exchange of information, electronically on internet.	2-Transaction Processing Electronically	3-Availability for commercial transactions 24x7x365	4-Goods cannot be inspected Physically before purchase
5-Screen-to-face Customer interaction	6-Business Scope Worldwide reach	7-Provides a uniform platform for information exchange.	8-One-to-one marketing
9-Delivery of goods Takes time, but now e-commerce websites have created options of same day delivery, or delivery within 4 hrs.			



(3) BENEFITS



(4) COMPONENTS

- ✓ User
- ✓ Internet/Network
- ✓ Web portal
- ✓ Payment Gateway
- ✓ Technology Infrastructure
 - ❖ Computers, Servers & Database
 - ❖ Mobile Apps
 - ❖ Digital Libraries
 - ❖ Data Interchange
- ✓ E-commerce Vendors
 - ❖ Suppliers & Supply Chain Management
 - ❖ Warehouse operations
 - ❖ Shipping & returns
 - ❖ E-Commerce catalogue & product display
 - ❖ Marketing & loyalty programs
 - ❖ Showroom & offline purchase
 - ❖ Different Ordering Methods
 - ❖ Guarantees
 - ❖ Privacy Policy
 - ❖ Security



Architecture of Networked Systems



(1)

Types of Architecture

(a) Two Tier

- Presentation Tier-allows user to interact with e-commerce/m-commerce vendor
- Database Tier- Product data price data / customer data & other related data are kept here.

Advantages

- ✓ System performance is higher because business logic & database are physically close.
- ✓ Since processing is shared between client & server, more users could interact with system.

Disadvantages

- ✓ Performance deteriorates if number of user's increases.
- ✓ There is restricted flexibility and choice of DBMS, since data language used in server is proprietary to each vendor.

(b) Three Tier

- **Presentation Tier** – Occupies top level & displays information related to services available on a website.
- **Application Tier** – It controls application functionality by performing detailed processing.
- **Database Tier** – Information is stored & retrieved.

Data in this tier is kept independent of application servers or business logic.

Advantages

- ✓ Clear separation of user interface control & data presentation from application-logic.
- ✓ Dynamic load balancing.
- ✓ Change management.

Disadvantages

- ✓ Creates an increased need for network traffic management, server load balancing & fault tolerance.
- ✓ Current tools are relatively immature & are more complex.
- ✓ Maintenance tools are currently inadequate for maintaining server libraries.

(2)

E-Commerce Architecture Vide internet

(a) Layer	(b) Includes	(c) Purpose
<ul style="list-style-type: none"> • Client / User Interface 	<ul style="list-style-type: none"> • User • Web Browser • Web Server 	<p>This Layer helps the e-commerce customer connect to e-commerce merchant customer logs to merchant systems. Allows customer to check products available on merchant's website.</p>
<ul style="list-style-type: none"> • Application Layer 	<ul style="list-style-type: none"> • E-merchant • Reseller • Logistics partner 	<p>This layer is accessible to user through application layer</p>
<ul style="list-style-type: none"> • Database Layer 	<ul style="list-style-type: none"> • Information store house, where all data relating to products, price it kept 	



(3)

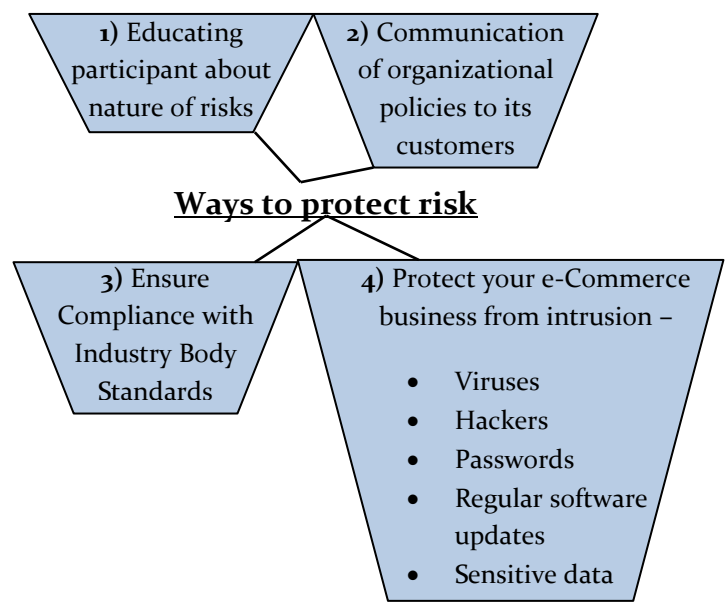
E-Commerce Architecture Vide M-Commerce

(a) Layer	(b) Includes	(c) Purpose
<ul style="list-style-type: none"> Client / User Interface Application Layer Database Layer 	<ul style="list-style-type: none"> Mobile APP (Application) User <ul style="list-style-type: none"> ✓ E-merchant ✓ Reseller ✓ Logistics partner ✓ Payment Gateway Information store house, where all data relating to products, price it kept 	<p>Helps e-commerce customer connect to e-commerce merchant Through these application's customer logs to merchant systems. This layer allows customer to check products available on merchant's website.</p> <p>This layer is accessible to user through application layer</p>

Risks & Controls

Risks
1) Privacy & Security
2) Quality issues
3) Delay in goods & Hidden Costs
4) Needs Access to internet & lack of personal touch
5) Security & credit card issues
6) Infrastructure
7) Problem of anonymity
8) Repudiation of contract
9) Lack of authenticity of transactions
10) Data Loss or theft or duplication
11) Attack from hackers
12) Denial of Service
13) Non-recognition of electronic transactions
14) Lack of audit trails
15) Problem of piracy

Controls



Cyber Security Risk Considerations

There could be cyber security risks with Direct as well as Indirect impact.

- A Direct Financial Impact could be if Application at Company's Retailers which contains financial information has weak passwords at all OSI layers resulting in harming integrity of data.
- An Indirect Operational Impact could be if sensitive customer information.

Control Objectives	1. Prevent organizational costs of data loss	2. Prevent loss from incorrect decision making	3. Prevent loss of Computer Hardware, Software & Personnel
	4. Prevent from high costs of computer Error	5. Safeguard assets from un-authorized access	6. Ensure data, integrity
			7. System Effectiveness Objectives
			8. System Efficiency Objectives





Guidelines & Laws Governing E-Commerce

1) Guidelines for E-Commerce

- 1) Billing
- 2) Product guarantee / warranty
- 3) Shipping
- 4) Delivery
- 5) Return
- 6) Payment

Special Laws governing E-Commerce

- 1) Information Technology Act, 2000
- 2) Reserve Bank of India, 1932

Steps of E-Commerce Work Flow Diagram

- 1) Customers login
- 2) Product / Service Selection
- 3) Customer Places Order
- 4) Payment Gateway
- 5) Dispatch & Shipping Process
- 6) Delivery Tracking
- 7) COD tracking

Commercial Laws Governing E-Commerce

- (1) Income Tax Act, 1961, (2) Companies Act, 2013, (3) Foreign Trade (Development and Regulation) Act, 1992, (4) The Factories Act, 1948, (5) The Custom Act, 1962, (6) The Goods and Services Tax Act, 2017 (GST), (7) Indian Contract Act, 1872, (8) The Competition Act, 2002, (9) Foreign Exchange Management Act, (FEMA 1999), (10) Consumer Protection Act, 1986



Digital Payments

Way of payment which is made through digital modes. Payer & payee both use digital modes to send & receive money. Also called electronic payment. No hard cash is involved. All transactions are completed online. Instant & convenient way to make payments.

Types (1) New Methods

- a) UPI Apps
- b) Immediate Payment Service (IMPS)
- c) Mobile Apps
- d) Mobile Wallets
- e) Aadhar Enabled Payment Service (AEPS)
- f) Unstructure Supplementary Service Data (USSD)

(2) Traditional Methods

- a) E-Wallet
- b) Card
- c) Net Banking

Advantages

- a) Easy and convenient
- b) Pay or send money from anywhere
- c) Discounts from taxes
- d) Written record
- e) Less Risk

(2) Drawbacks

- a) Difficult for a Non-technical person
- b) The risk of data theft
- c) Overspending



Computing Technologies

VIRTUALIZATION

Concept – Core concept of Virtualization lies in Partitioning, which divides a single physical server into multiple logical servers. Once physical server is divided, each logical server can run an operating system & applications independently.

Application Areas :

1. Server Consolidation
2. Disaster Recovery
3. Testing & Training
4. Portable Applications
5. Portable Workspaces

Types :

1. Hardware Virtualization
2. Network Virtualization
3. Storage Virtualization



Grid Computing

(A) Concept – It is a special kind of distributed computing. In ideal grid computing system, every resource is shared, turning a computer network into a powerful supercomputer. Every authorized computer would have access to enormous processing power & storage capacity.

(B) Benefits – (1) Making use of Underutilized Resources, (2) Resource Balancing, (3) Parallel CPU Capacity, (4) Virtual resources & virtual organizations for collaboration, (5) Access to additional resources (6) Reliability, (7) Management

(C) Types of Resources – (1) Computation, (2) Storage, (3) Communications, (4) Software & Licenses, (5) Special equipment, capacities, architectures, & policies.

(D) Grid Computing Security – (1) Single Sign-on, (2) Protection of Credentials, (3) Interoperability with local security solutions, (4) Exportability, (5) Support for secure group communication, (6) Support for multiple implementations.



Cloud Computing

Characteristics

- | | | | | | |
|-----------------------------|----------------|--------------|---------------|------------------|----------------------|
| 1. Elasticity & Scalability | 2. Pay-per-Use | 3. On-demand | 4. Resiliency | 5. Multi Tenancy | 6. Workload Movement |
|-----------------------------|----------------|--------------|---------------|------------------|----------------------|

Advantages

- | | |
|---|--|
| 1. Achieve economies of scale | 6. Pervasive accessibility |
| 2. Reduce spending on technology infrastructure | 7. Monitor projects more effectively |
| 3. Globalize workforce | 8. Less personnel training is needed |
| 4. Streamline business processes | 9. Minimize maintenance & licensing software |
| 5. Reduce capital costs | 10. Improved flexibility |



Drawbacks

- | | | |
|--|---|---|
| 1. If Internet connection is lost, link to cloud & thereby to data & applications is lost. | | |
| 2. Security is a major concern as entire working with data & applications depend on other cloud vendors or providers. | 3. Does not permit control on these resources as these are not owned by the user or customer. | 4. Customers may have to face restrictions on availability of applications, operating systems & infrastructure options. |
| 5. Applications may not reside with a single cloud vendor & two vendors may have applications that do not cooperate with each other. | | |

Cloud Computing Environment

(1) Private :

Resides within boundaries of an organization & used exclusively for the organization's benefits.

Characteristics :

- Secure
- Central Control
- Weak Service Level

Advantages :

- Improves average server utilization, higher efficiencies in low cost
- High level of security & privacy to user.
- Small, controlled & maintained by organization.

Limitation :

IT teams in organization may have to invest in buying, building & managing clouds independently. Budget is a constraint in private clouds & they also have loose SLA's.

(2) Public : IT is provisioned for open use by general public. It may be owned, managed, & operated by a business, academic, or government org. or some combination of them. Services are offered on pay-per-use basis.

Characteristics : (a) Highly Scalable, (b) Affordable, (c) Less Secure, (d) Highly Available, (e) Stringent SLAs.



Advantages :

- 1- Used in development, deployment & management of enterprise applications, at affordable costs.
- 2- Deliver highly scalable & reliable applications rapidly.
- 3- No need for establishing infrastructure for setting up & maintaining cloud.
- 4- Strict SLAs are followed.
- 5- There is no limit for number of users.

Limitation :

Security assurance & thereby building trust among clients is far from desired but slowly liable to happen. Further, privacy & organizational autonomy are not possible.

(3) Hybrid :

It is a combination of both at least one private (internal) & at least one public (external).

Characteristics : (1) Scalable, (2) Partially Secure, (3) Stringent SLAs, (4) Complex Cloud Management.

Advantages : (1) Highly scalable, (2) Provides better security than public cloud.

Limitation : Security features are not as good as private cloud & complex to manage.

(4) Community :

It is provisioned for exclusive use by a specific community of consumers from organizations that have shared concerns.

Characteristics : (1) Collaborative & Distributive Maintenance, (2) Partially Secure, (3) Cost Effective.

Advantages : (1) Establishing a low-cost private cloud, (2) Collaborative work, (3) Sharing of responsibilities. (4) Better security than public cloud.

Limitation : Autonomy of organization is lost & some of security features are not.

Service Models			
<p>a) IAAS</p> <ul style="list-style-type: none"> ✓ Web access to resources ✓ Centralized ✓ Elasticity & Dynamic ✓ Shared infrastructure. ✓ Metered Services <p>Instances</p> <p>(1) NAAS, (2) STAAS, (3) DBAAS, 4) DTAAS</p>	<p>b) PAAS</p>	<p>c) SAAS</p> <p>Instances</p> <p>(1) TAAS, (2) APIAAS, (3) EAAS</p>	<p>d) Other</p> <p>(1) CASS, (2) DAAS, (3) SECAAS, (4) IDAAS</p>





Mobile Computing

It refers to the technology that allows transmission of data via a computer without having to be connected to a fixed physical link. Mobile data communication has become a very important & rapidly evolving technology as it allows users to transmit data from remote locations to other remote or fixed locations.

- Components**
- Mobile Communication
 - Mobile Software
 - Mobile Hardware

- Limitations**
- Insufficient Bandwidth
 - Security Standards
 - Power consumption
 - Transmission interferences
 - Potentials health hazards
 - Human interface with device

- Benefits**
- Remote access to work order details
 - Update work order status in real-time, facilitating excellent communication.
 - Access to corporate services & information at any time, from anywhere
 - Improve management effectiveness by enhancing information quality
 - Remote access to corporate knowledge base job location



<p>Green Computing</p> <p>It is study & practice of establishing/using computers & IT resources in a more efficient & environmentally friendly & responsible way.</p>	<p>Green Computing Best Practices</p> <ul style="list-style-type: none"> ○ Develop a sustainable Green Computing plan. ○ Recycle ○ Make environmentally sound purchase decisions. ○ Reduce Paper Consumption ○ Conserve Energy 	<p>Challenges</p> <ul style="list-style-type: none"> ▪ Cost ▪ Immediate help ▪ How to evaluate ▪ Security issues ▪ Still evolving
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BYOD

BYOD refers to business policy that allows employees to use their preferred computing devices, like smart phones & laptops for business purposes

- Emerging BYOD Threats**
- ✓ Network Risks
 - ✓ Device Risks
 - ✓ Application Risks
 - ✓ Implementation Risks

Advantages

- ❖ Happy Employees
- ❖ Lower IT budgets
- ❖ IT reduces support
- ❖ Early adoption of new Technologies
- ❖ Increased employee efficiency.



Web 3.0

Also known as Semantic Web, describes sites wherein computers will be generated raw data on their own without direct user interaction.

Components (1) Semantic Web (2) Web Services

Internet of Things

Application

- Home appliances
- Office machines
- Governments can keep track of resource utilization

Risks

- Risk to Product manufacturer
- Risk to user of these products
 - Security
 - Privacy, autonomy & control
 - Intentional obsolescence of devices
- Technology Risk
- Environmental Risk due to Technology



Artificial Intelligence

<p>Definition – Ability to use memory, knowledge, experience, understanding, reasoning, imagination & judgement to solve problems & adapt to new situations.</p>	<p>Applications – (1) Autonomous vehicles, (2) Medical diagnosis, in cancer research, (3) Proving mathematical theorems, (4) Online assistants</p>	<p>Risks – (1) AI relies heavily of data it gets. Incorrect data can lead to incorrect conclusions (2) AI carries a security threats (3) AI in long term may kill human skills of thinking the unthinkable</p>
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Machine Learning	<p>Definition – It is a type of AI that provides computers with ability to learn without being explicitly programmed. It focuses on development of computer programs that can change when exposed to new data.</p>
	<p>Applications – (1) Autonomous vehicles, (2) Medical diagnosis, in cancer research, (3) Playing games, (4) Online assistants</p>
	<p>Risks – It being an application based on AI, the nature of risk to it remain similar to those posed by AI systems.</p>



CHAPTER - 5

CORE BANKING SYSTEMS

Overview of Banking Services

Key features of a banking business are as follows:

- i) Custody of large volumes of monetary items.
- ii) Dealing in large volume of transactions.
- iii) Wide network of branches & departments, which are geographically dispersed.
- iv) Banks provide multi-point authentication checks & highest level of information security.

Core Banking services

- Acceptance of Deposits
- Granting of Advances
- Remittances
- Collections
- Clearing
- Letters of Credit & Guarantees
- Credit Cards
- Debit Cards

Other Banking Services

- Back operations
- Retail Banking
- High Net-worth Individuals
- Risk Management
- Specialized Services

Challenges of IT

- i) Frequent changes or obsolescence of technology.
- ii) Multiplicity & complexity of systems.
- iii) Different types of controls for different types of technologies/systems.
- iv) Proper alignment with business objectives & legal/regulatory requirements.
- v) Dependence on vendors due to outsourcing of IT services.
- vi) Vendor related concentration risk.
- vii) Segregation of Duties (SoD)
- viii) External threats leading to cyber frauds/crime
- ix) Higher impact due to intentional or unintentional acts of internal employees
- x) New social engineering techniques employed to acquire confidential credentials.
- xi) Need for governance processes to adequately manage technology & information security.
- xii) Need to ensure continuity of business processes in event of major exigencies.





IT Risks & Risk Assessment

I- Definition of Risk

- i) Potential harm caused if a threat exploits a particular vulnerability to cause damage to an asset.
- ii) Risk Analysis is defined as process of identifying security risks & determining their magnitude & impact on an organization.

II- Impact of IT Risks

- i) External dangers from.
- ii) Misuse & abuse of information system affecting privacy & ethical values.
- iii) Phishing attacks through Internet Banking.

III- IT Risk Management

Risk management strategy:-

- i) Avoid
- ii) Mitigate
- iii) Transfer
- iv) Accept

VI- Key indicators of effective IT controls

- Ability to execute & plan new work such as IT infrastructure upgrades required to support new products & services.
- Development projects that are delivered on time & within budget, resulting in cost-effective.
- Ability to allocate resources predictably.
- Consistent availability & reliability of information.
- Clear communication to management.
- Ability to protect against new vulnerabilities & threats.
- Efficient use of a customer support center or help desk.
- Heightened security awareness on part of the users & a security-conscious culture.

IV- Indicators of higher IT risk

- i) IT security is not given required priority.
- ii) Attitude of 'Computer will take care of everything – no checking is required.
- iii) Lack of transparency of IT operations & responsibility assigned.
- iv) Lack of Input control.
- v) Lack of output verification.
- vi) Lack of evidence.
- vii) Lack of access control.
- viii) Lack of audit trails.
- ix) Lack of dual checks for sensitive & high value transactions.
- x) Lack of documented disaster recovery plan/contingency plan/Business Continuity Plan.
- xi) Lack of controls leading to temptation to commit frauds.
- xii) No check on vendors for reliability of software.
- xiii) Over-dependence on long serving.

V- Importance of IT Controls

- Provide reasonable assurance that business objectives are achieved & undesired events are prevented or detected & corrected.
- IT Controls are implemented to achieve control objectives & are implemented through specific set of control procedures.
- Controls provides a clear policy & good practice for directing & monitoring performance of IT to achieve enterprise objectives.
- IT Controls perform dual role:
 - ✓ They enable enterprise to achieve objectives.
 - ✓ They help in mitigating risks.
- IT controls promote reliability & efficiency & allow organization to adapt to changing risk environments.

VII- Internal Control System in Banks

- i) Internal Controls in Banks.
- ii) IT Controls in Banks.



Applying IT Controls

iii) General Controls

- a) Information Security Policy.
- b) Administration, Access, & Authentication.
- c) Separation of key IT functions.
- d) Management of Systems Acquisition & Implementation.
- e) Change Management.
- f) Backup, Recovery & Business Continuity.
- g) Proper Development & Implementation of Application Software.
- h) Confidentiality, Integrity & Availability of software & data files.
- i) Availability refers to ensuring availability of information to users when required.
- j) Incident response & management.

iv) Application Controls

Component & Architecture of CBS

Overview of CBS – It refers to a common IT solution where in a central shared database supports entire banking application.



CBS Architecture – Some key aspects in-built into architecture of a CBS are as follows:

- i) Information law.
- ii) Customer centric.
- iii) Regulatory compliance.
- iv) Resource optimization.

Core features of CBS –

- i) On-line real-time processing.
- ii) Transactions are posted immediately.
- iii) All databases updated simultaneously.
- iv) Centralized Operations.
- v) Separate hierarchy for business & operations.
- vi) Business & Services are productized.
- vii) Remote interaction with customers.
- viii) Reliance on transaction balancing.
- ix) Authorizations occur within application.
- x) Increased access by staff at various levels based on authorization.
- xi) Daily, half yearly & annual closing.
- xii) Automatic processing of standing instructions.
- xiii) Centralized interest applications for all accounts & account types.
- xiv) Anytime, anywhere access to customers & vendors.

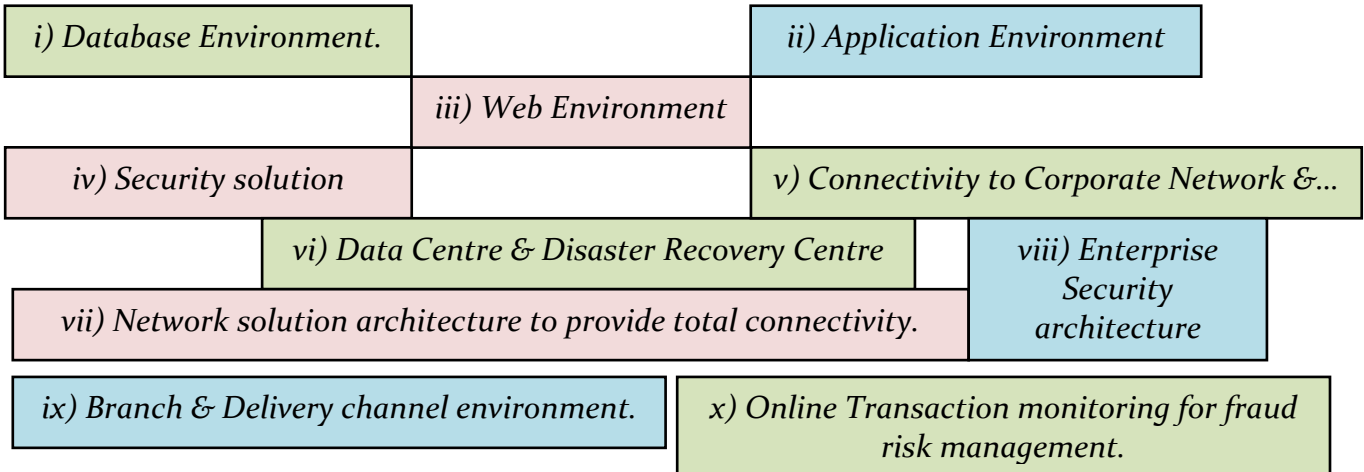
Components/Features of Core Banking –

- i) Opening new accounts.
- ii) Managing deposits & withdrawals.
- iii) Interest calculation & management.
- iv) Payments processing.
- v) Loans disbursement & management.
- vi) Processing cash deposits & withdrawals.
- vii) Processing payments & cheques.
- viii) Processing & servicing loans.
- ix) Accounts management.
- x) Configuring & calculating interest.
- xi) Customer relationship Management (CRM), activities.
- xii) Setting criteria for minimum balances, interest rates, withdrawals allowed, limits.
- xiii) Maintaining records for all bank's transactions.

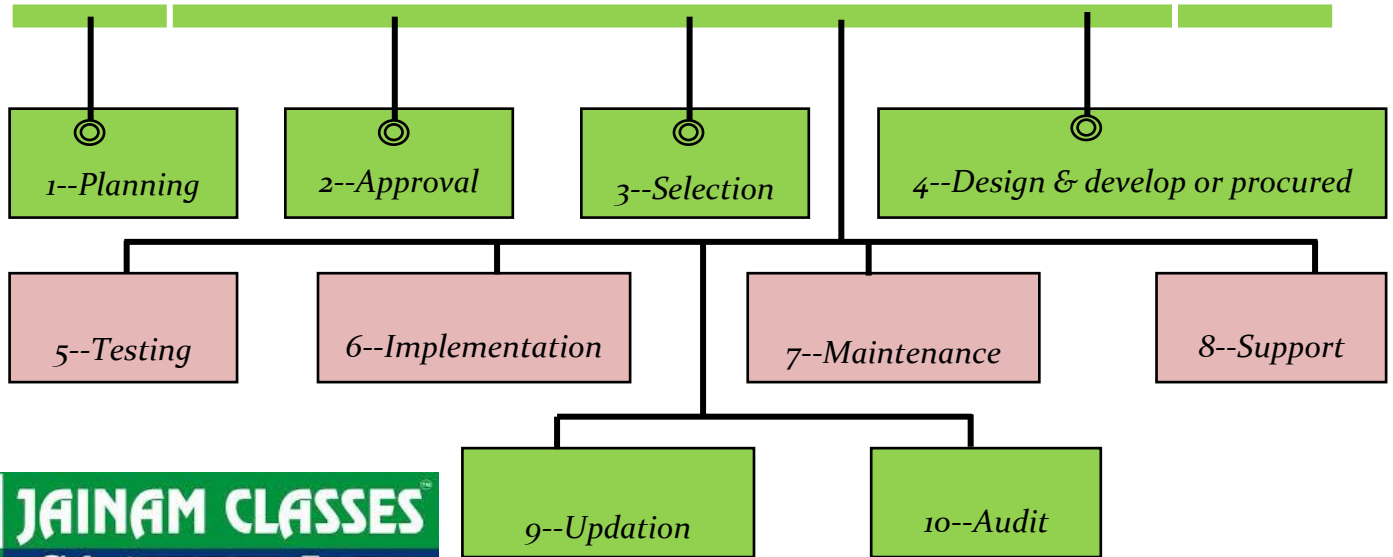




Technology Components



How Does CBS Work?



CBS IT Environment

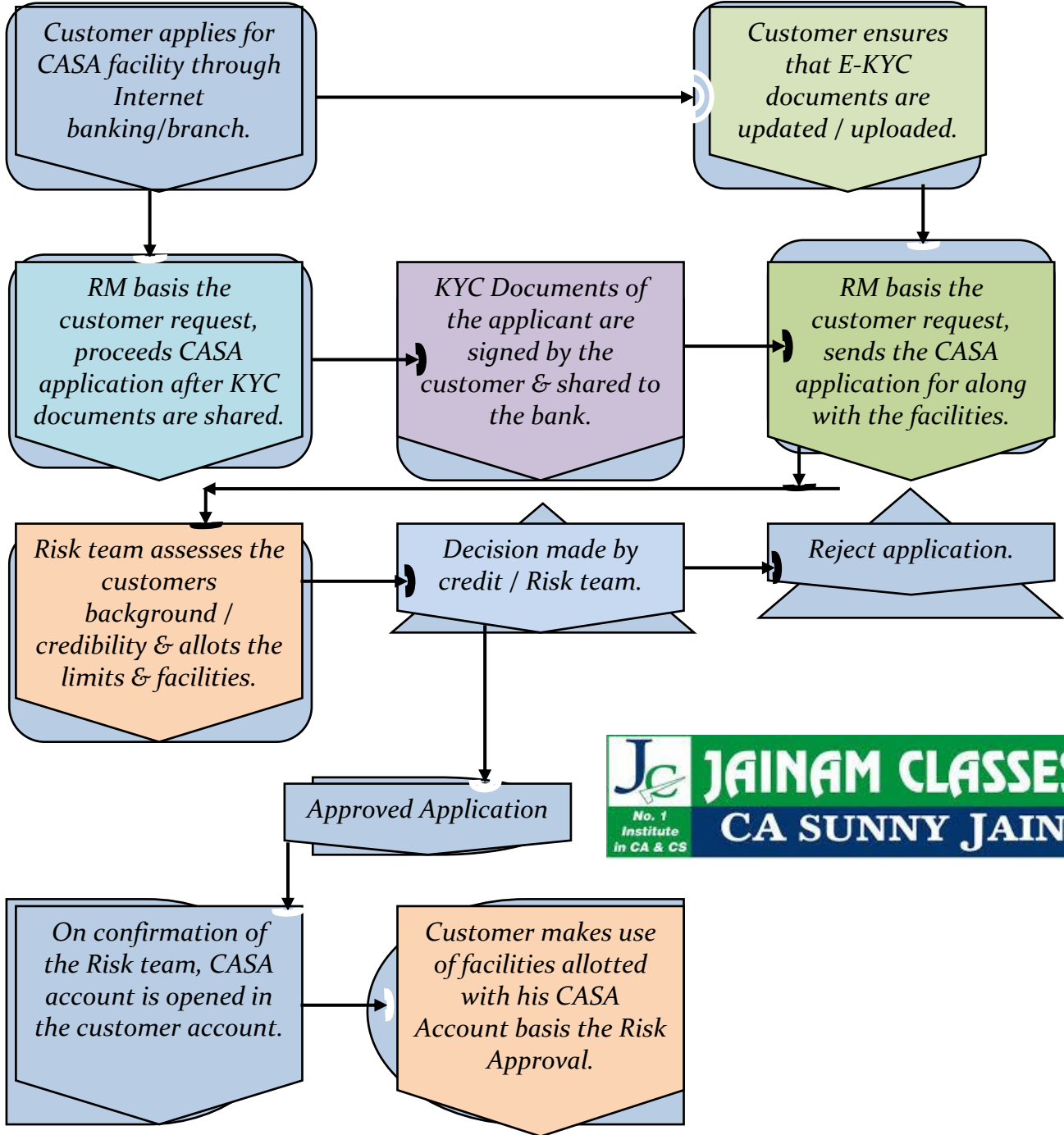
Types of servers used in deploying CBS.

- i) Application Server.
- ii) Database Server.
- iii) Automated Teller Machines (ATM) Channel Server.
- iv) Internet Banking Channel Server (IBCS)
- v) Internet Banking Application Server
- vi) Web Server
- vii) Proxy Server
- viii) Anti-Virus Software Server.



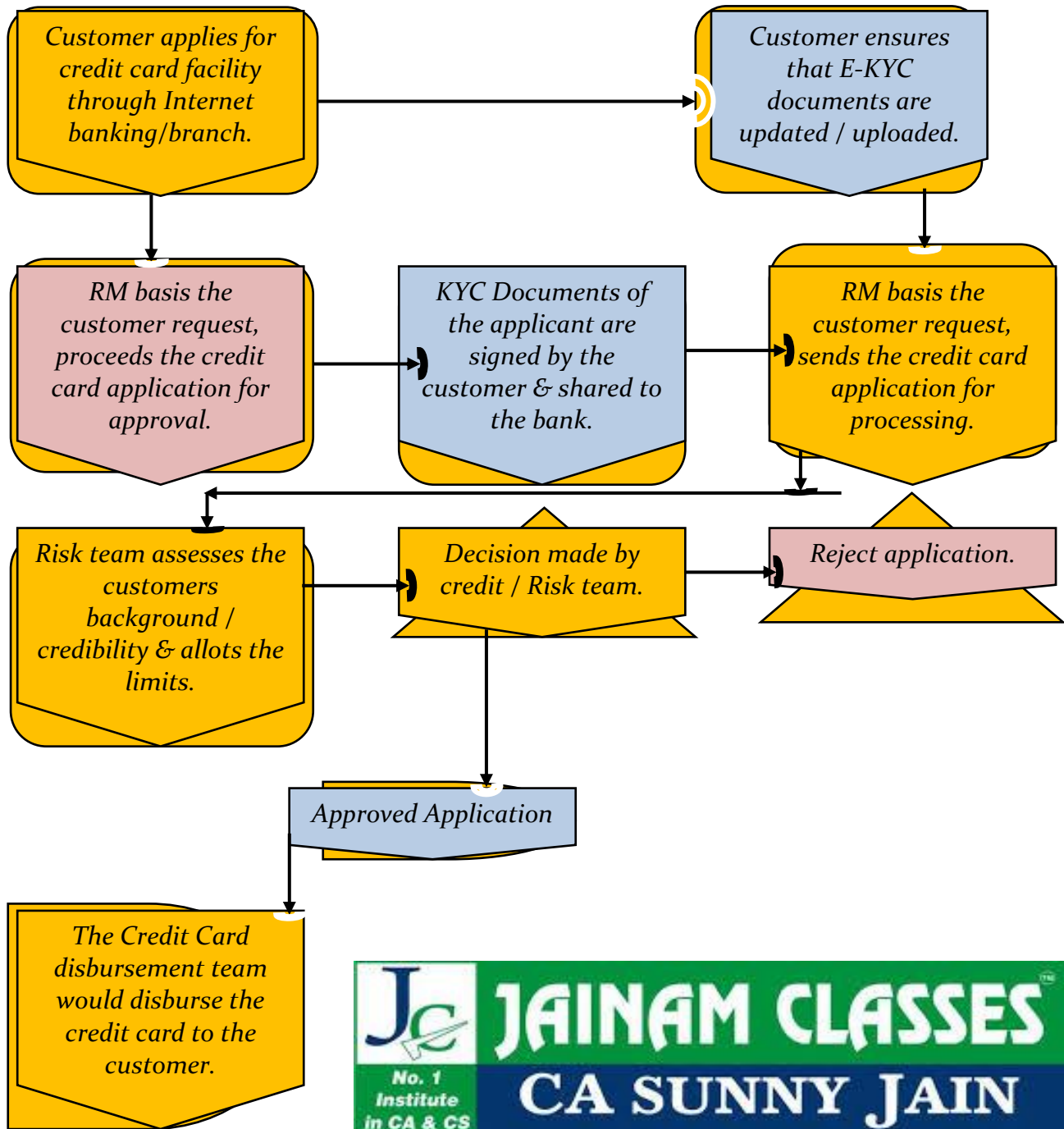
Core Business Flow & Relevant Risks and Controls

I) Business process flow of Current & Savings Accounts (CASA)



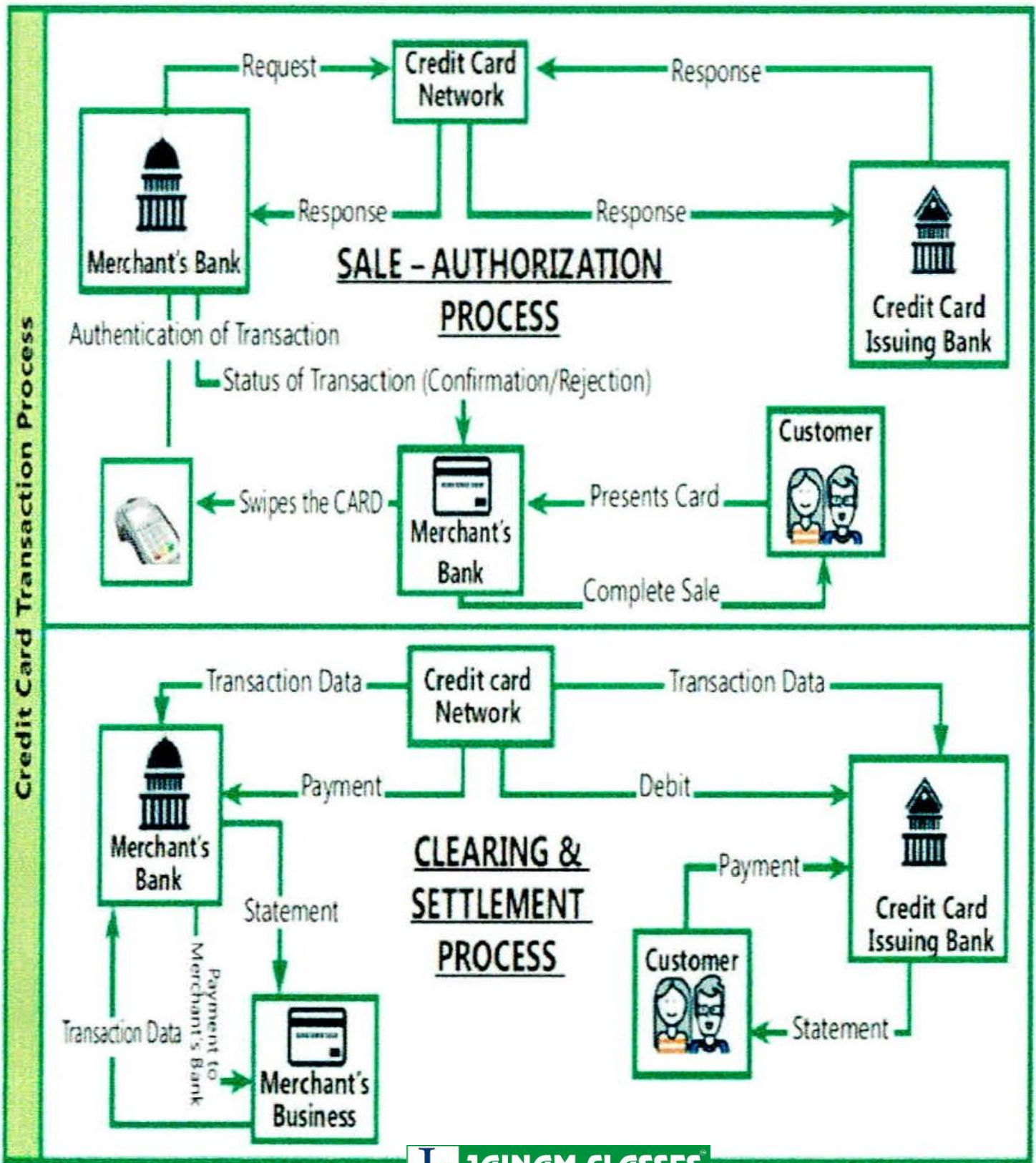


II) Business Process Low of Credit Cards
a) Process Flow of Issuance of Credit Card Facility





b) Process Flow of Sale – Authorization process of Credit Card Facility





III) Business Process Flow of Mortgages

i) Types of Mortgage Loan

a) Home Loan

b) Top up loan

c) Loans for Under Construction Property

ii) Process Description



a) Loans are provided by lender which is a financial institution. There are 2 types of loan widely offered to customer first is fixed rate mortgage second is variable/floating rate mortgage.

b) Borrower/Customer approaches bank for a mortgage & relationship manager/loan officer explains customer about home loan. Customer to fill loan application & provide requisite KYC documents.

c) Loan officer reviews loan application & sends it to Credit risk team who will calculate financial obligation income ratio. Along with customer documents details are sent to underwriting team for approval.

d) Underwriter will ensure that loan provided is within lending guidelines & at this stage provide conditional approval along with list of documents required.

e) As per property selected by customer, loan officer will provide property details along with requisite documents to the legal & valuation team.

f) Further verification of property to determine whether property is built as per approved plan, builder has received requisite certificates, age of building to determine whether it will withstand loan tenure, construction quality.

g) Legal & valuation team will send their report to operations team, which entails all details of loan.

h) Customer will agree to loan agreement which is offered by signing offer letter. Loan officer will notarize all loan documents & are send back to lender operations team.

i) Once signed offer letter is received operations team release or disburse fund & prepare a cashier order.



j) Post disbursement of loan customer can carry out various loan servicing activity by visiting the branch or via online mode amendments.

IV) Treasury Process

i) Core areas of Treasury Operations

a) Dealing Room Operations (Front office operations)

b) Middle Office (Market Risk department / Product Control Group)

c) Back office.

ii) Process flow for Bank Treasury Operations

Front Office

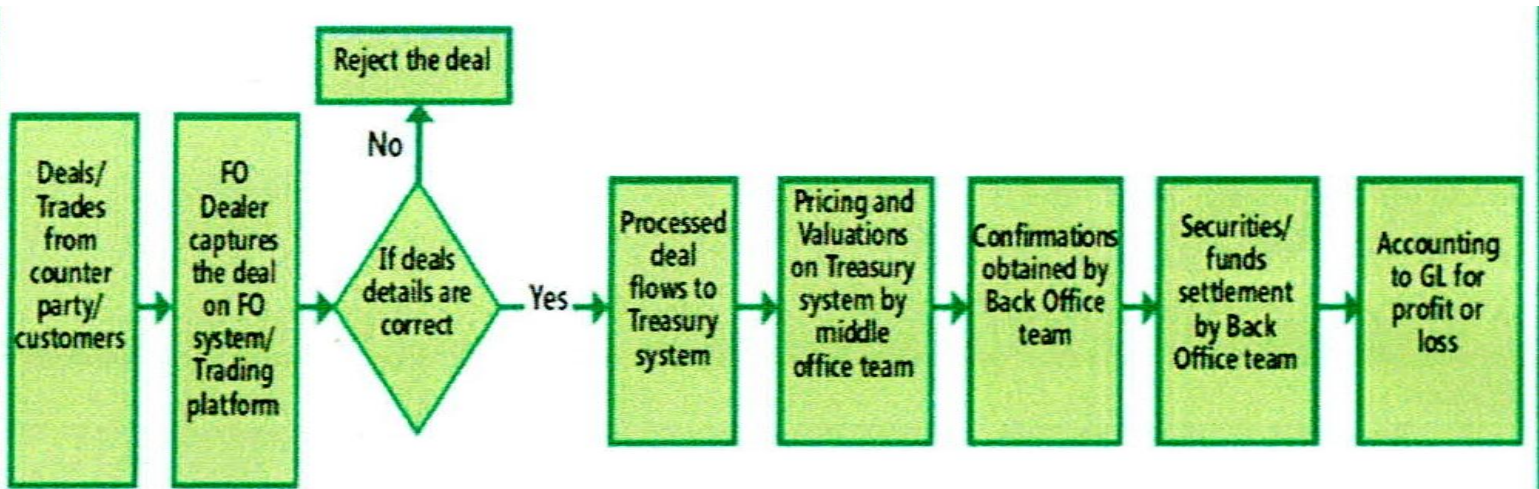
1. Pre Deal Analytics
2. Trade Deals Capture
3. Position Management

Middle Office

1. Risk Management.
2. Asset liability management.
3. Pricing and Valuations.
4. Position management/Limit management.

Back Office

1. Reconciliation
2. Confirmations
3. Securities/Funds Settlements
4. Accounting.



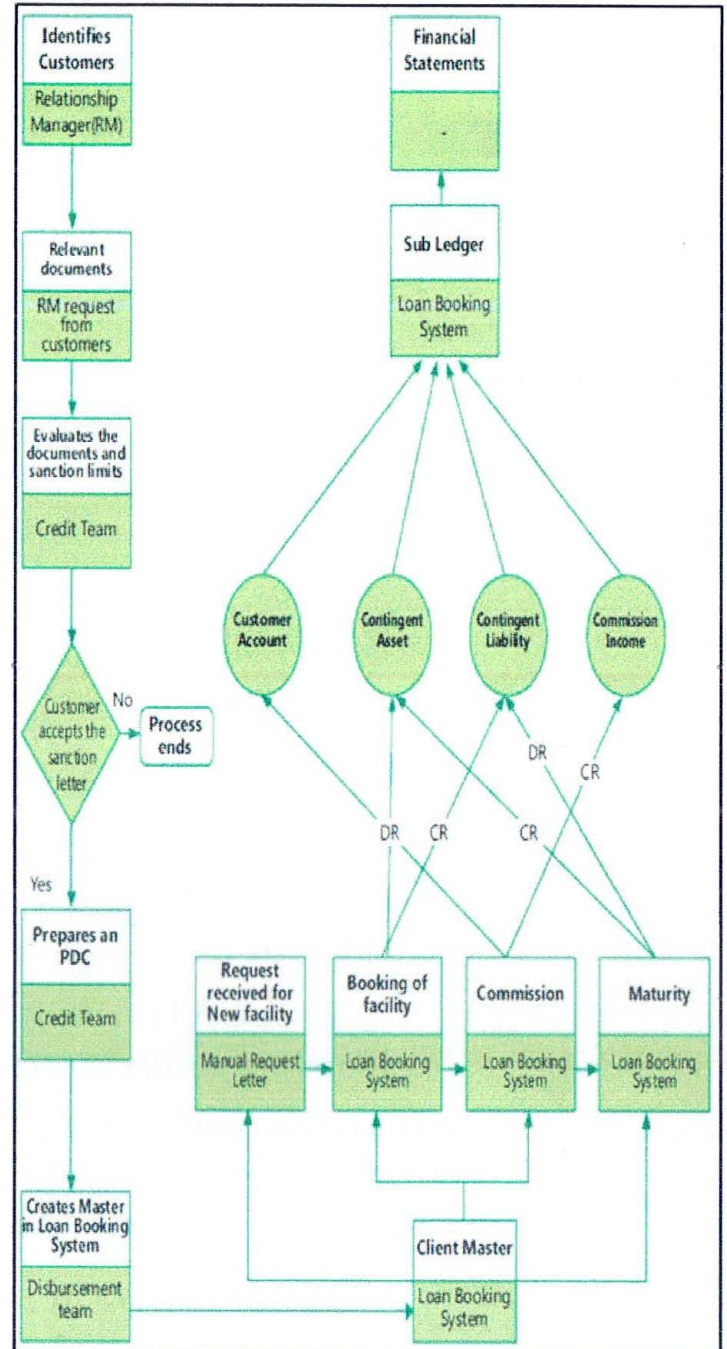
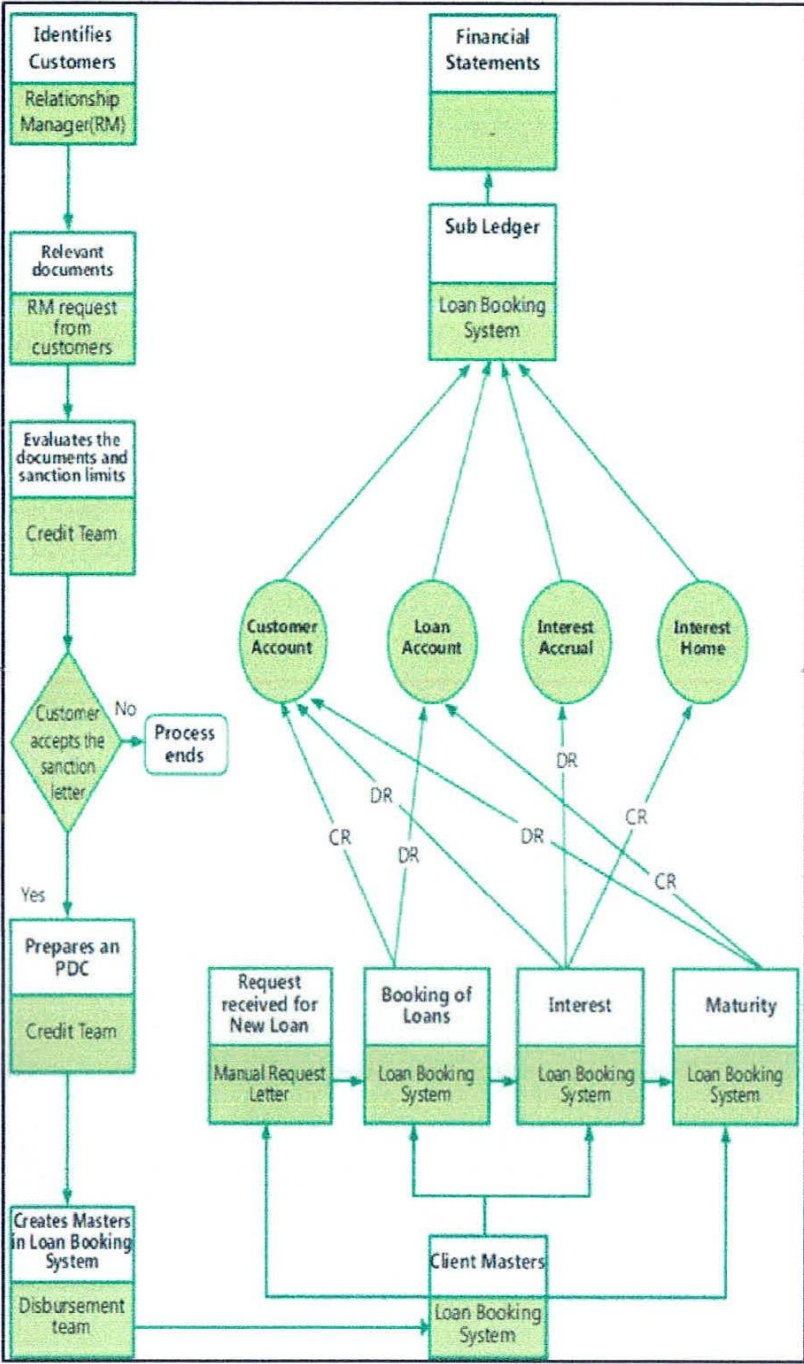


v) Loans & Trade Finance Process

Classification of Credit Facilities:

a) Fund Based Credit Facilities

b) Non-Fund Based Credit Facilities



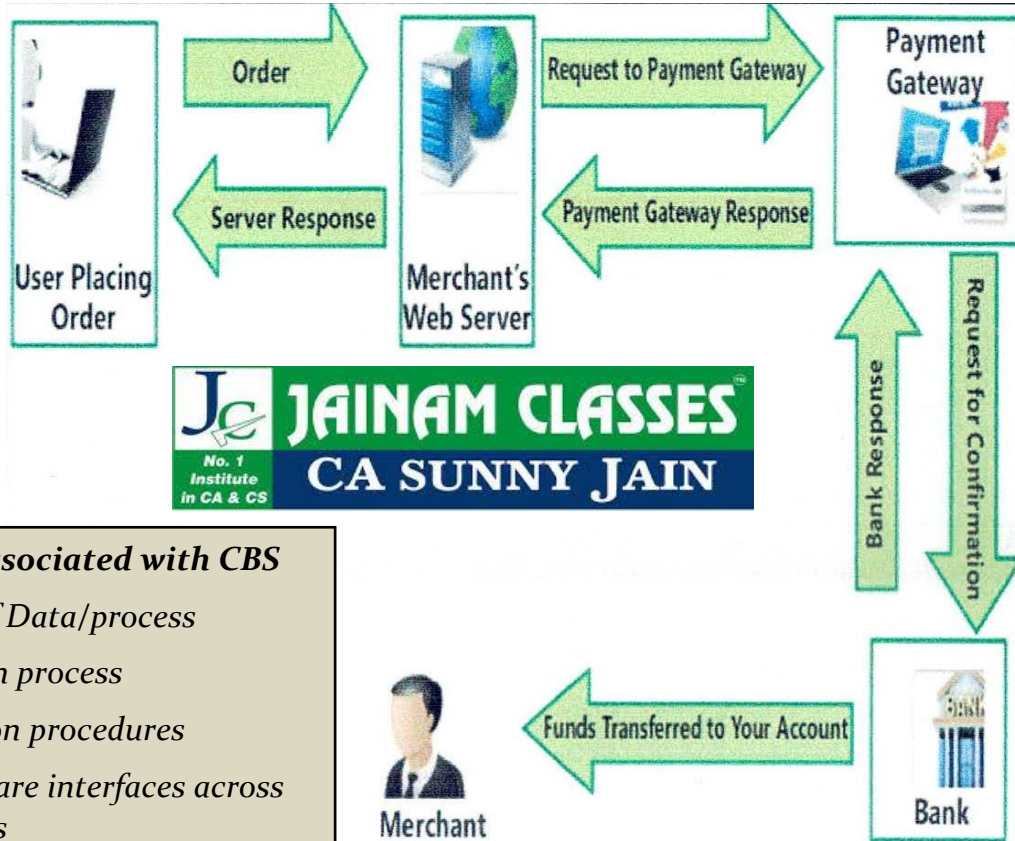
vi) Internet Banking Process – Customer is provided internet banking facility, which would include:

- a) Password change
- b) Balance inquiry
- c) Fund transfer
- d) Request for cheque book
- e) Stop payment
- f) Copy of statement of account
- g) ATM/Credit Card related queries.



vii) E-Commerce Transaction processing

- a) Most of e-Commerce transactions involve advance payment either through a credit or debit card issued by a bank.
- b) Flow of transaction when a customer buys online from vendor's e-commerce website:-



viii) Risks associated with CBS

- a) Ownership of Data/process
- b) Authorization process
- c) Authentication procedures
- d) Several software interfaces across diverse networks
- e) Maintaining response time
- f) User Identify Management.
- g) Access Controls
- h) Incident handling procedures
- i) Change Management

b) Data Centre & Network Operations

- i) Backups & Restoring of data.
- ii) Job & Batch Scheduling and Processing.
- iii) Monitoring of Applications & supporting Servers.
- iv) Value Add areas of Service Level Agreements (SLA)
- v) User training & qualification of Operations personnel.

ix) IT related Risks and mitigating Controls

a) Classification of Risk:-

- i) Efficiency
- ii) Effectiveness
- iii) Reliability
- iv) Confidentiality
- v) Integrity
- vi) Availability
- vii) Compliance



c) Information Security

- i) Information Security Policies, Procedures, & practices.
- ii) User Security Administration.
- iii) Application Security.
- iv) Database Security.
- v) Operating System Security.
- vi) Network Security
- vii) Physical Security

d) Application Software

Functions of the software are:-

- i) Configuration
- ii) Masters
- iii) Transactions
- iv) Reports



Applicable Regulatory & Compliance Requirement

I) Banking Regulation Act – Act provides a framework using which commercial banking in India is supervised & regulated.

II) Negotiable Instruments Act, 1881 (NI Act) –

- a) Under NI Act, Cheque includes electronic image of truncated cheque & a cheque in electronic form.
- b) A cheque in the electronic form has been defined as ‘a mirror image’ of a paper cheque.

III) RBI Regulations – Some of the key functions of RBI:-

- a) Monetary Authority.
- b) Regulator & supervisor of financial system:
- c) Issuer of currency.

IV) Money Laundering – It is process by which proceeds of crime & true ownership of those proceeds are concealed or made opaque so that proceeds appear to come from a legitimate source.

a) Prevention of Money Laundering Act (PMLA)

*** Key aspects of PMLA**

- i) Maintenance of record of all cash transactions above Rs. 10 lakhs.
- ii) All series of cash transactions of value less than Rs. 10 lakhs integrally connected if they have taken place within a month.
- iii) All cash transactions here forged or counterfeit notes have been used.
- iv) All suspicious transactions made in cash or otherwise.

IV) Information Technology Act –

- a) Cyber crimes
- b) Computer related offences.

Examples of offences in IT Act –

- a) Section 65 : Tampering with Computer Source Documents.
- b) Section 66: Computer Related Offences.
- c) Section 66-B: Punishment for dishonestly receiving stolen computer resource or communication device.
- d) Section 66-D: Punishment for cheating by personation by using computer resource.
- e) Section 66-E: Punishment for violation of privacy.

*** 3 stages of Money Laundering**

Placement-----Layering----Integration

*** Anti-Money Laundering (AML) using Technology**

*** Financing of Terrorism**

v) Sensitive Personal Data Information (SPDI)



i) Risk around CASA Process

- a) Credit Line setup is unauthorized & not in line with banks policy.
- b) Customer Master defined in CBS is not in accordance with Pre-Disbursement Certificate.
- c) Inaccurate interest/charge being calculated in CBS.
- d) Unauthorized personnel approving CA-SAS transaction in CBS.
- e) Inaccurate accounting entries generated in CBS.

ii) Risks around Credit Card Process

- a) Credit Line setup is unauthorized & not in line with banks policy.
- b) Credit Line setup is unauthorized & not in line with banks policy.
- c) Masters defined for customer are not in accordance with Pre-Disbursement Certificate.
- d) Credit Line setup can be breached.
- e) Inaccurate interest/charge being calculated in Credit Card system.
- f) Inaccurate reconciliations performed.

iii) Risk around Mortgage Process

- a) Incorrect customer & loan details are captured which will affect overall downstream process.
- b) Incorrect loan amount disbursed.
- c) Interest amount is incorrectly calculated & charged.
- d) Unauthorized changes made to loan master data or customer data.

iv) Risk around Treasury Process

- a) Unauthorized securities setup in systems such as Front office/Back office.
- b) Inaccurate trade is processed.
- c) Unauthorized confirmations are processed.
- d) Insufficient Securities available for Settlement.
- e) Incomplete & inaccurate data flow between systems.
- f) Insufficient funds are available for settlements.
- g) Incorrect Nostro payments processed.





v) Risk in loans & Advances Process

- a) Credit Line setup is unauthorized & not in line with banks policy.
- b) Credit Line setup is unauthorized & not in line with banks policy.
- c) Masters defined for customer are not in accordance with Pre-Disbursement Certificate.
- d) Credit Line setup can be breached in Loan disbursement system/CBS.
- e) Lower rate of interest/Comm many be charged to customer.
- f) Facilities/Loan's granted may be unauthorized / inappropriate.
- g) Inaccurate interest / charge being calculated in loan disbursal system.

vi) Risks w.r.t. Data Centre & Network Operations

- a) Transaction may not be recorded completely or accurately, & related items will be inaccurately or incompletely recorded.
- b) Invalid items may be recorded or valid items may be inaccurately or incompletely recorded.
- c) Timely & adequate technical support may not be available & issue may not be resolved.
- d) User queries may not be timely & adequately resolved.
- e) Timely execution & complete processing & availability of data may not be ensured.
- f) Unavailability of applications & data backups in event of a disaster. It can also result in disclosure of sensitive info.
- g) Data may be lost & systems may not be recoverable in event of a serious system failure. This may result in regulatory/legal complaints, loss of reputation beside financial loss.
- h) Backup may not be available.



vii) Risks & Controls w.r.t. Information Security

- a) Significant information resources may be modified inappropriately, disclosed without authorization, and/or unavailable when needed.
- b) Lack of management direction & commitment to protect information assets.
- c) User accountability is not established.
- d) Unauthorized system or data access, loss & modification due to virus.
- e) Potential Loss of confidentiality, availability & integrity of data & system.
- f) It is easier for unauthorized users to guess password of an authorized user & access system and / or data. This may result in loss of confidentiality, availability & integrity of data & system.



- g) Unauthorized viewing, modification or copying of data and / or unauthorized use, modification or denial of service in system.
- h) Potential loss of confidentiality, availability & integrity of data & system.
- i) Inadequate preventive measure for key server & IT system in case of environmental threat like heat, humidity, fire, flood etc.
- j) Security breaches may go undetected.

viii) Risks w.r.t. Application Controls

- a) Interest may be incorrectly computed leading to incorrect recording of income / expenditure.
- b) Inappropriate assignment of rate codes resulting in violation of business rules & / or loss of revenue.
- c) Absence of appropriate system validations may result in violation of business rules.
- d) Inappropriate reversal of charges resulting in loss of revenue.
- e) Failure to levy appropriate charges resulting in loss of revenue.
- f) Multiple lines in excess of deposit value may result in inability recover outstanding in event of a default.
- g) Inappropriate security or controls over system parameter settings resulting in unauthorized or incorrect changes to settings.
- h) Inappropriate set up of accounts resulting in violation of business rules.
- i) Failure to automate closure of NRE/NRO accounts on change in residence status may result in regulatory non-compliance & under benefits to customers.
- j) Failure to levy appropriate charges resulting in loss of revenue. Inappropriate levy of charges, resulting in customer disputes.
- k) Incorrect classification and provisioning of NPA's resulting in financial misstatement.

