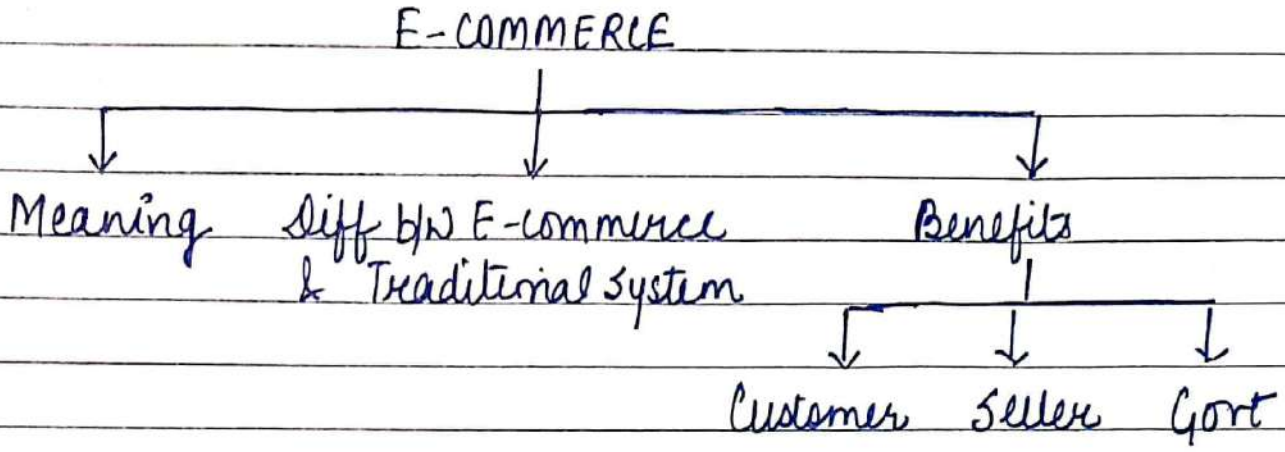
EIS-SM

CHAPTER-4 E-COMMERCE, M-COMMERCE & EMERGING TECH.



Meaning of E-commerce

- It is the process of doing business Electronically.
- It refers to the use of technology "to enhance"

↓

Processing of commercial transactions

↓

through reliable & secured connections.

Diff between Traditional & E-commerce

	TRADITIONAL	E-COMMERCE
Meaning	Includes all those activities which encourages exchange of Goods/Services in manual or non-electronic way.	Carrying out commercial transactions or exchange of information on the Internet electronically.

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Amended Points (May 2021)

Location	• It requires a "market place" to operate • Location should be convenient for both owners & customers	• It requires "marketspace" to operate • Website should be highly visible & easy to find.
Size	• Size of items & no. of customers influence the size of store • Stores having heavy traffic need to choose location with adequate parking & entrances etc.	• Size of business model is influenced by products & customers • Online stores with heavy traffic need to have enough bandwidth, processing power etc
Marketing	They do not have to spend much to acquire new customers comparatively.	They need to advertise their presence more via internet.
Business Scope	Limited to particular Area.	Worldwide reach
Information Exchange	No uniform Platform for exchange of Informatn	Provides Uniform Platform.
Delivery of Goods	Instantly	Takes time
Fraud	Relatively Lesser	Lack of Physical Presence can rise frauds
Profit Impact	Less Profit Margin	High Profit Margin

Transaction Processing	Manual	Electronic
Availability	Limited	24x7
Nature of Purchase	Physical inspection before purchase	NO inspection before purchase
Customer Interaction	Face to face	Screen to face
MC: CAN'T MEANING		

Benefits of E-Commerce

CUSTOMER	SELLER	GOVERNMENT
• Convenience • Time Saving • Various Options • Easy to find reviews • Coupons & Deals • Anytime access	• Increased customer Base • Instant transaction • Reduction in cost • Efficiency is improved • Easier entry to New markets	• Instrument to fight curruption • Reduction in use of Ecologically damaging material
MC CCTV	MC: Easier to Increase Efficiency through Instant cost Reduction	

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Disadvantages of E-business (ADDED MAY 2021)

Internet Connection	Many people do not have internet connectivity due to which online txns not possible
High Set up Costs	Cost involved in Connection, H/W, S/W, etc & thereafter maintenance too.
Legal issues	The legal environment in which e-commerce is conducted is full of unclear & conflicting Laws.
Business Limitations	Items such as perishable foods, high cost items such as jewellary selling. Businesses may never land themselves to e-commerce regardless of technologies.
Cultural Impediments (Obstacle Roda)	• Customers fearful of sharing Credit Card numbers over Internet • Customers are uncomfortable viewing items on a screen rather than in person.
Security Concern	Biggest disadvantage. It includes technical obstacles & fear of safety of personal informat^{n} due to malware & spywares ruling Internet (MC: SIS-BRO)

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E-commerce Business Models
(ADDED MAY 2020 & AMENDED MAY 2021)

B2C	Includes retailers who sell P&S online via Internet	E shops, E-malls, E auctions, Portal Buyer Aggregator	Amazon.com
B2B	Website sells to other Org, supplier, compay or partners online	E-auction, Portal E-procurement E-distribution E-marketing	Indiamart .com
C2C	Consumers sell directly to other Consumers	E-auctions, Virtual Commu.	E-Bay.com
C2B	Consumer set prices & companies bid to offer Product & services	E-marketing E-distribut^n	Bankbazar .com
C2G	Consumers txn with Govt	E-marketing	Incometax India.gov.in
G2C	Allows Consumers to provide feedback or ask informatn	E-marketing	e-Seva
B2G	Websites used by Govt to trade with various organisations	E-marketing	e-krafts India.

E-markets or E-business Markets

1	E-Shops	• Virtual store - Sells P&S online • Direct Sales to Customers • Convenient Way, allow manufacturers to bypass intermediate operators	
2.	E-malls	• Re-tailing model of a shopping mall • Collaboration of different shops situated in a convenient location in e-commerce.	amazon
3	E-auctions	• Electronic auctions provide channel of communication for bidding process • P&S for bidding are listed for competing buyers	ebay
4	Portals	• Portals are the channels through which websites are offered as content • It can be a source of revenue, charging for advertising etc.	naukri.com
5	Buyers Aggregators	• Firm collects the information about P&S providers [make the providers their partners] & sell under own brand name	

		• The Buyer Aggregator brings together large no. of buyers so that they can gain the types of savings that are usually the priviledge of large volume of Buyers.
6.	Virtual Communities	• Community of Customers who share a common interest & use the internet for same. [means for communication] • More people, greater the benefits that accrue, without any additional cost
7.	E-marketing	• Use of internet to achieve marketing objectives. • Information displayed on websites impact the Customers & they compare prices of the products by rival firms. • The internet changes the relationship between Seller & Buyer.
8.	E-procurement	• Mgt of all procuring activities through electronic / internet. • Information providers i.e infomediaries specialize

		in providing up to date & real time information on all the aspects of supply of materials to businesses. • It helps to - deliver on time - Savings in cost - Secure value deals.	C1INDIA
9.	E-distribution	• Helps distributor to achieve efficiency savings by managing large volumes of customers, automated orders, facilitating value-adding services • It aims to provide fully integrated e-business enabled solution.	CONNECT INDIA

E-mall types (Added May 2022)

General malls	• Have a variety of items for sale • do not specialize in selling any one item
Specialized malls.	• Would sell only specialized items • 99acres.com deals in B&S of property/housing

AMENDED MAY 2021

Components of E-Commerce

i) User

- may be an individual / Org.
- Using Ecommerce platform.

ii) E-commerce Vendors

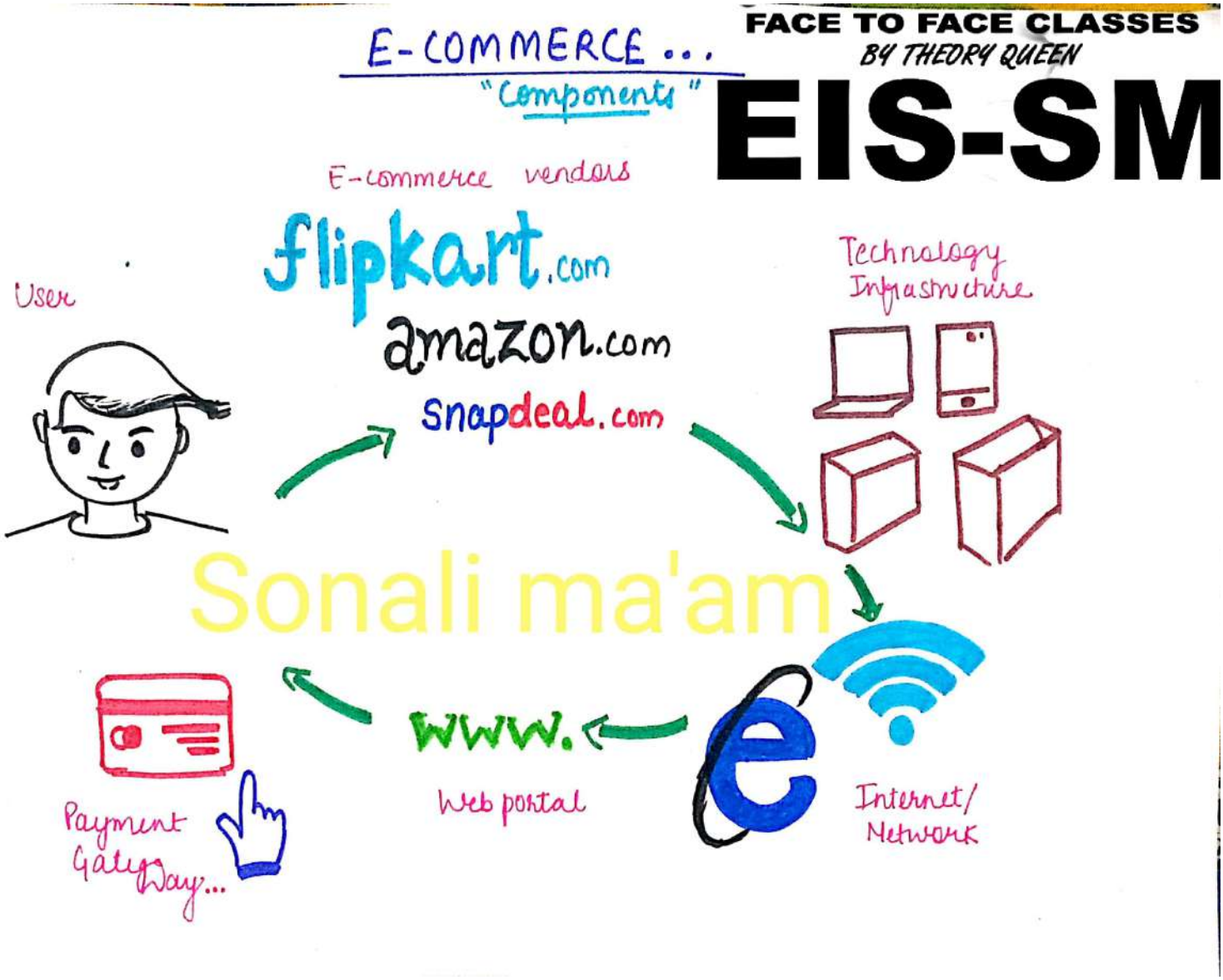
- Organisation providing the required P&S
- ENSURE FOLLOWING FOR BETTER, EFFECTIVE & EFFICIENT TRANSACTION –
  - Suppliers & SCM
  - Warehouse operations
  - Shipping & returns policies
  - Marketing & loyalty program
  - Different Ordering methods [COD, NB]
  - Privacy & Security Policy.

iii) Technology Infrastructure

It Includes →

Computer Servers & Database	Mobile Apps	Digital Library [collection of digital objects]	Data Interchange [Electronic Communication of Data]

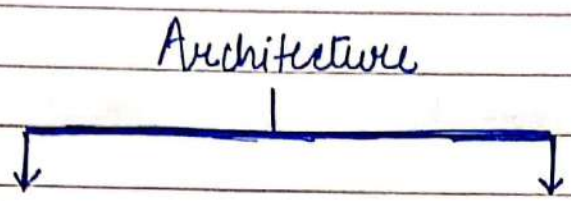
Catalogs	Mobile Store front Module
Voucher, Coupons	Mobile ticketing Module
Mktg campaings	Mobile Advertising & Mktg Module
Info about Retailer	Mobile Customer Support Module
Mobile Payments	Mobile Banking


E-COMMERCE ...
"Components"
FACE TO FACE CLASSES
BY THEORY QUEEN
EIS-SM
E-commerce vendors
flipkart.com
amazon.com
snapdeal.com
User
Technology Infrastructure
Sonali ma'am
Payment Gateway...
www.
Web portal
Internet/ Network

	Further, the technology used should be - Scalable to handle peak traffic - Easy to use & convenient for customers - Responsive design of website
iv) Internet / Network	• Faster net connectivity leads to better e-commerce • Latest communicatn technologies like 5G have made roads in India
v) Web Portal	• It is an application through which user interacts with e-commerce vendor (front end) • It can be accessed via laptop, mobile etc • First impression is very important & simplicity & clarity of content on web portal is directly linked to customer experience of buying product online.
vi) Payment Gateway	• Payment Gateway represents the way to collect online payments • It is a system of computer processing that authorizes, verifies & accepts/decline the online payment txns. • Payment Gateway provides online real time completion of txns. • Paypal (eg).

Architecture of Networked System.

Architecture = Style / Method of Construction
E-commerce = Way Network Architectures are build



Two tier Architecture

- Client (User) sends request to Server & Server responds by fetching data from it.
- It is divided into 2 tiers - Presentation Tier
  - Database Tier.

- Presentation Layer - Interface that allows user to Interact & Displays the various products / prices (request to Customer)

- Database Layer - Contains data of Customer, Product etc

- Advantages - System Performance Increases
  - More Users could Interact
  - Easy maintenance
  - Simple structure

[MC: Easy sms]

- Disadvantages - Performance decrease when consumer ↑
  - Restriction to choice of DBMS (DB2)

Three tier Architecture

- Architecture in which functional process of logic, data access, computer data storage & User Interface are maintained as Independent Modules on separate platforms
- It is divided into 3 tiers - Presentation Tier
  - Application Tier
  - Database Tier.

- Application layer - Known as Middle layer, Logic tier
  - This tier is pulled from presentation tier
  - Perform detailed processing
  - Eg - Billing

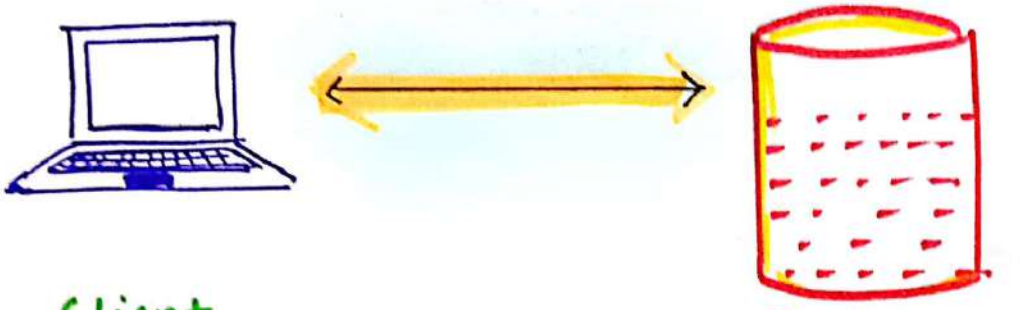
- Advantages - Clear separation
  - Load balancing
  - Change mgt is Easy

[MC: EASY-CL]

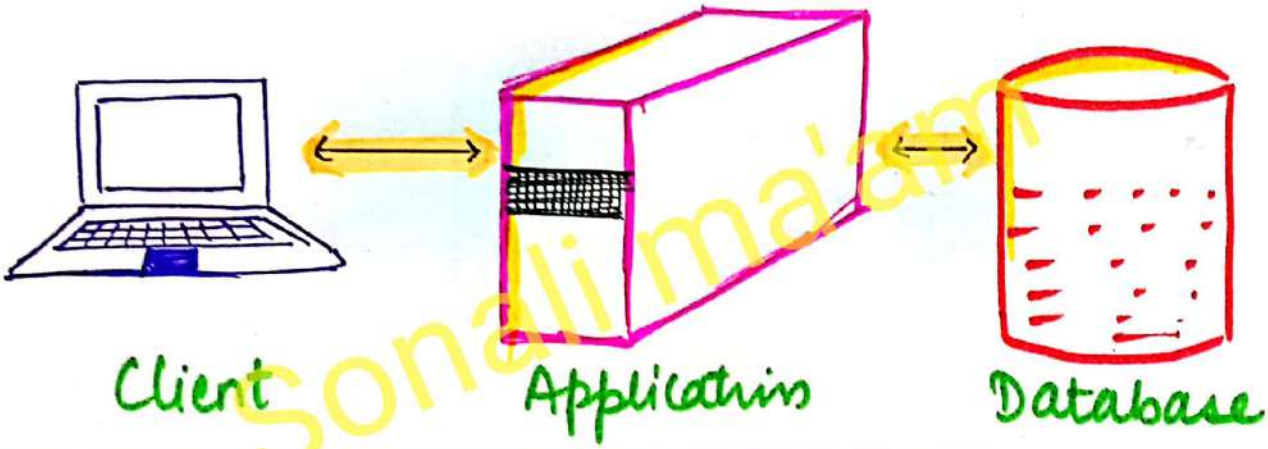
- Disadvantage - Increased need for Network mgt
  - Complex
  - Maintenance is a big challange

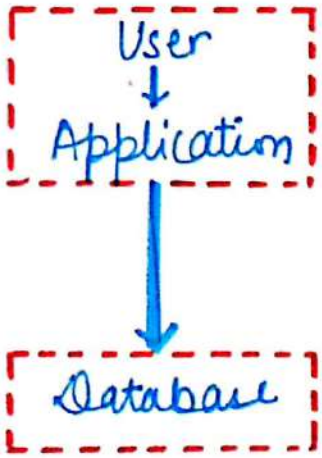
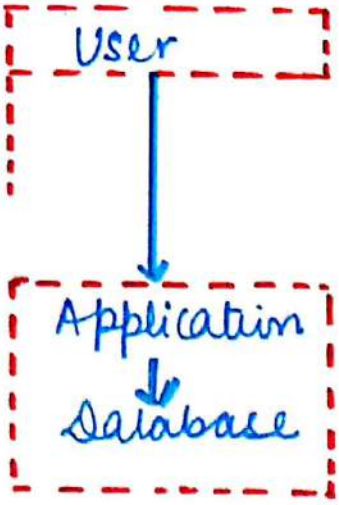
E-COMMERCE USES 3 TIER ARCHITECTURE

Two Tier Architecture...



Three Tier Architecture...

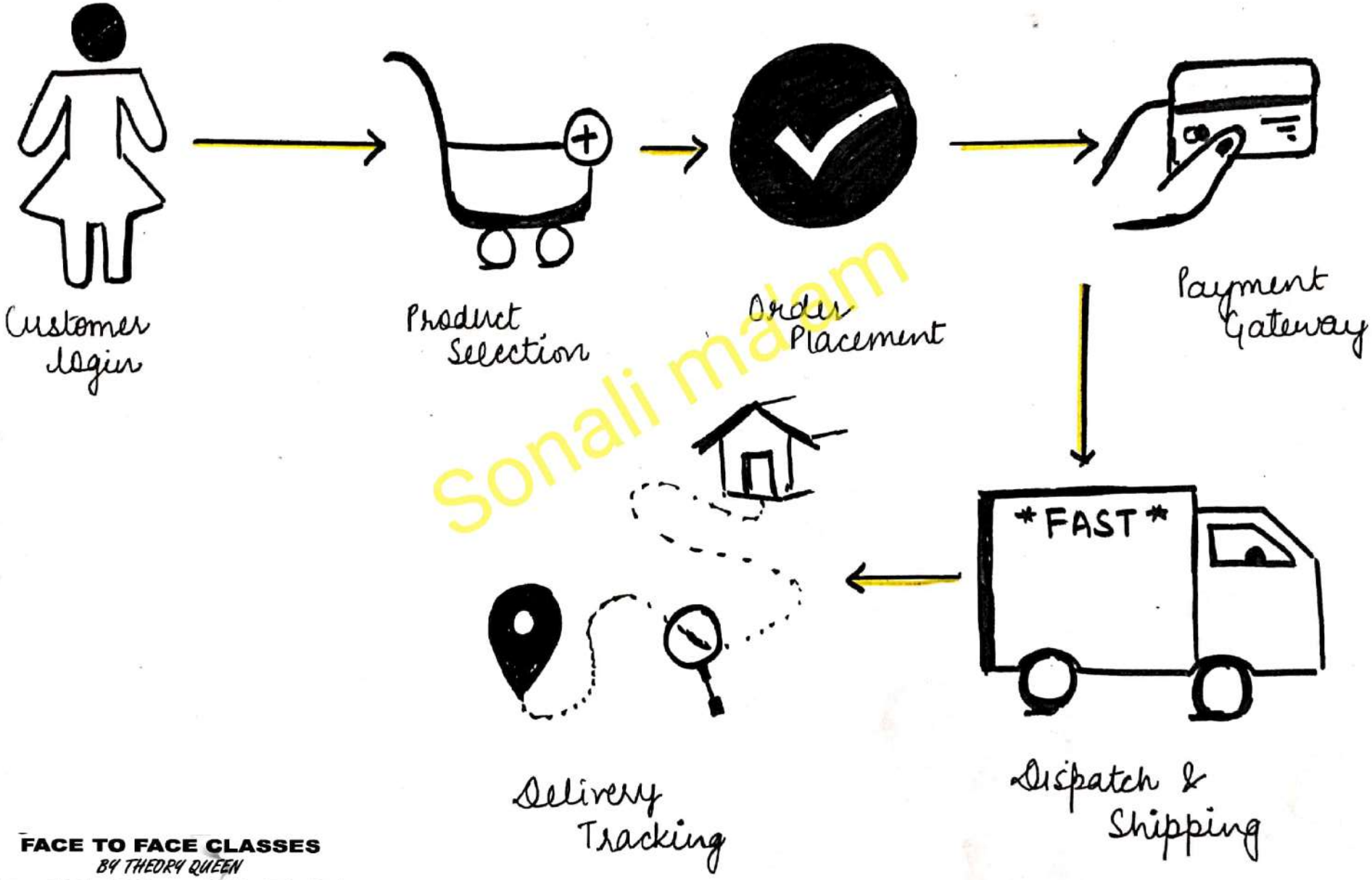


Two-tier	Three tier.
	

E-COMMERCE Work flow

Step	Activities
i) Customer Login	• May be through phone or any other E-mode.
ii) Product Selection	• Customer selects the PCs from the available options
iii) Customer Places the Order	• Order is placed for the selected PCs by the customer.
iv) Payment Gateway	• Customer makes selection of payment method. (Many methods are available) • The merchant gets the update from Payment Gateway about payment realisation the customer.
v) Dispatch & Shipping	• Inventory managed by self/ or via 3rd party, the dispatch process will be initialed.
vi) Delivery Tracking	• Delivery staff have Hand held devices, which helps in Live Tracking.
vii) COD Tracking	• In case of COD, additional checks are needed on matching delivery with payments by merchants.

WORKFLOW DIAGRAM FOR E-COMMERCE



Risks & Controls (AMENDED MAY 2021)

- Risks in e-business Envt
- Controls in e-business Envt
  - Controls Reqd
  - How to apply Controls?

RISKS

S	Privacy & Security	Org Exposes itself to security threats & privacy issues due to Lack of knowledge
A	Attack from Hackers	Webservers used for E-commerce may be vulnerable to hackers
D	Denial of Service	• Shut down of network resulting in denial of Service (impossible for users to access) • longer the shut down, more damage as customers cannot make purchases or visit.

D	Data Loss or theft
A	Authenticity of txns
N	Needs to Internet access
G	Goods may have Quality Issues
E	Electronic txns may not be recognised
R	Repudiation of Contract by service provider or customer

Controls (on the persons)

- Users
- Seller/Merchant
- Govt
- Network Service Provider
- Technology " "
- Logistics " "
- Payment Gateway

Users	• Genuine User • There is a risk if User accounts are hacked & hackers buy P&S.
Seller	• Controls on - Product Catalogues, Price Catalogues - Discount & promotional schemes - Product Returns.
Govt	• Tax accounting of all products • All P&S are legal
NSP	• Ensure availability & Security of Network • Any downtime of Network can be a loss for busi
TSP	• Website hosting, cloud space availability
LSP	• They are the ones who are finally responsible for timely Product deliveries
Payment Gateway.	• Payment Gateways need to be efficient, Effective & foolproof

Intrusion = Interference

How to apply Controls ?

i) Educating participant about the risk involved	• for eg - putting ads on websites about DO's & Don'ts for Online Payments
ii) Communication of Org policies to customers	To avoid disputes provide information about – Refund Policies – Shipping & Billing policies etc
iii) Ensure compliance with Industry body standards	like RBI Guidelines for Payment Gateway.
iv) Protect E-commerce business from intrusion	Instructions Include (i) Viruses - regular check ii) Hackers - Use S/W packages iii) Passwords - changed frequently iv) Regular S/W update v) Sensitive Data - (Using Encryption S/W)

Consideration of Cyber Security Risk in the audit [CYBER SECURITY RISK CONSIDERATION]

- The Business & technological Environment in which the entities operate are rapidly changing on account of the E-commerce platform on which most of them Operate.
- Therefore, It is necessary to considerate the Cyber Security Risks in the audit procedures.

There could be Cyber Risk with Direct & Indirect Impact

DIRECT	INDIRECT
• Direct financial Impact • Occurs if the financial Information has weak password's resulting in harm of data	• Indirect Operational Impact • Occurs if there is a breach in legal/Regulatory actions on the company on account of breach of Confidential Information

SA 315 recognises that IT poses specific Risks to an Entity's Internal Control in the form of following-

- Unauthorised → access to data
  → change in master file, programs
- Reliance on system which is inaccurately processing data
- Inappropriate manual intervention
- IT personnel enjoying access privileges beyond required.

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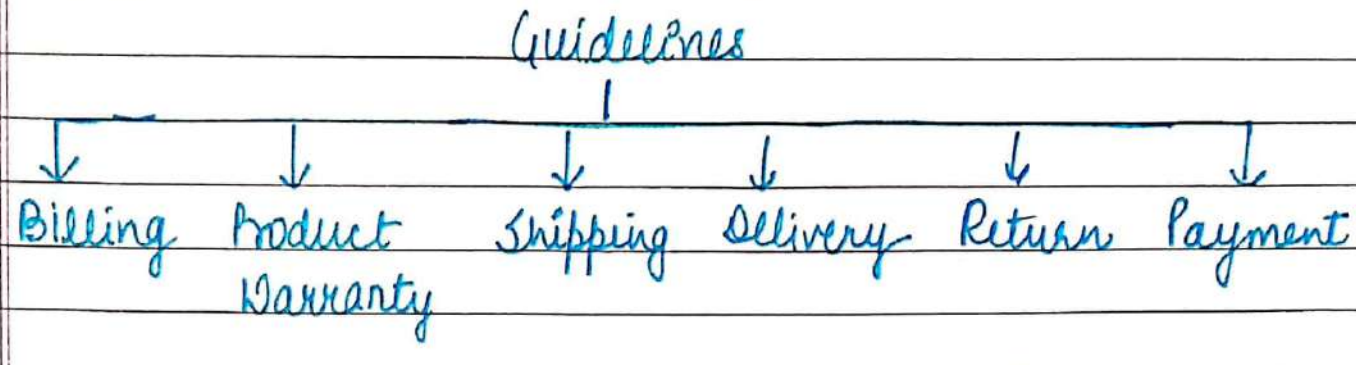
Controls of Cyber Security

- Network Diagram बना कर रखना पड़ेगा।
  [Details about servers, hubs, routers etc]
- List of Digital Assets
  [Harddisk कितनी है, CPU कितने हैं, Monitor कितने हैं]
- Any Incident of Cyber Security Breach to be communicated on time
- CIO [Chief Infor^n Officer] के द्वारा Review होना चाहिए
- क्या IT managers are appropriately handling the responsibility of Safeguarding the Assets?
- IT Resources के Access के upar Adequate approvals होना चाहिए [कोई लगातार Overtime कर रहा है]
- Use of FIREWALLS

(6) Guidelines Governing E-commerce

(All entity going for e-commerce business needs to create clear guidelines for the following)



Billing	• format • Details / Description • GST application
Warranty	• Proper display on bill
Shipping	• Shipping time, mode • frequency of shipping • Shipment packaging
Delivery	• Mode [courier, ✉] • Time & Day • Where (Place)
Return	• which goods accepted to be returned? • No. of days • Process of verifying authencity of Products received back. • Time of Refund
Payment	• Mode

(12) Laws Governing E-commerce

(1) General (Commercial)
- Income Tax Act, 1961
- Companies Act, 2013
- Factories Act etc, 1948...

(2) Special Laws.
- IT Act, 2000
- RBI, 1932.

COMMERCIAL LAWS

i) Income Tax Act 1961	• Provisions regarding taxation of Income in India • Deciding the Place of Origin is important
ii) Companies Act, 2013	• Most of the merchants are companies [Corporate Sector] & • It regulates Corporate Sectors.
iii) Foreign Trade Devp & Regulation Act, 1992	• Foreign trade = Export, Import • All these txns are regulated by this Law • Like: Amazon has allowed Indian Citizens to purchase from its Global stores
iv) Factories Act, 1948	• Act to regulate working conditions of workers • It includes merchants to comply with some of the Regulations of this Act.
v) Custom Act, 1962	• Levy of Custom duty.

vi) GST Act, 2017	• Requires to upload Sales, purchase • Reconciliations of txns • Payment of GST • Filling of E-Returns
vii) Contract Act, 1872	• Define contents of Valid Contract
viii) Competition Act, 2002	• Regulate Practices that may have adverse effect on competition
ix) FEMA Act, 1999	• FDI • Flow of forex • FDI upto 100% is permitted
x) Consumer Protect Act, 1986	• Consumer Rights • Law to Protect Consumers.

SPECIAL LAWS

i) IT Act, 2000 (AMENDED MAY 2021)

- Due to anonymous nature of Internet, people with intelligence have been grossly mis-using Internet to commit criminal activities, this necessitated need for framing & enforcing laws.
- It deals with
  - Legality of P&S offered online
  - Data Protection
  - Customer Privacy Protection
  - Online Advertising Compliance. etc

Objectives of IT Act (ADDED MAY 2021)

a) To grant legal recognition
   - txns carried out by means of electronic data
   - digital signature for authenticat^{n} of Informat^{n}
   - transfer fund electronically
   - Keeping books of A/c in electronic format

b) To provide legal infrastructure to promote e-commerce

c) To facilitate electronic
   - filing of documents with Govt depts
   - Storage of data

d) To manage Cyber-Crimes

e) Governs all Internet Activities in India, to all the online txns.

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Provisions Relating to IT Act (ADDED MAY 2021)

Sec 4	• Provides for Legal Recognition of electronic Records • Email would now be a valid & legal form of communication that can be duly produced & approved in court.
Sec 3	• Provides the conditions, where an electronic record may be authenticated by means of affixing digital signature • Therefore, Digital Signatures have been given legal validity
Sec 6	• It lays down the foundation of Electronic Governance • It provides that - filing any form, application, other document, - Creation, retention of records - Issue/grant of license/permit - Receipt/payment in Govt offices & its agencies may be done through electronic form.
Sec 14	• It relates to security of electronic txns • It provides that where any security procedure has been applied to an electronic record at a specific point of time, then such record shall be deemed to be secured from such point of time to time of verification
Sec 15	Provides for Security Procedure applied to DS for being treated as secured DS

Trends in E-commerce

Content	• The content of web should be such which not only attract customer's attention but also helps them in engaging • Eg shoppable vidos intead of images
Social Commerce	• Social media is an integral part of almost every consumer online habits. • Eg. Facebook, Youtube, Insta. • Concept of commerce using it is in trend
Mobile Commerce	• The user is moving from dekstop to mobile • Creation of mobile application for e-commerce site is the latest trend to drive large no. of customers.
Biometrics	• Biometric Verification is a recent technology that measures physical characteristics (fingerprints, face, voice) to solve security issues in e-commerce • Due to it, there will be no problem of stolen / fogotten password.
Artificial Intelligence	• Use of chatbots (chat + robot), a fully authomated chat agent answering the questions of consumers & acting as a first point of Contact

	Chatbots commonly known as messenger bots is a piece of software that can be used by a retailer to chat with customers via text or voice
Predictive Analysis.	• It is a tool which help in predicting customers buying habits, as well as their tastes & preferences (both qualitative & quantitative) • It help s in offering right customer, the right product, the right way at right time.

(MC: BIOMETRIC - CAMPS)

DIGITAL PAYMENTS (AMENDED MAY 2021)

- Meaning
- Types/Methods
  - New
  - Traditional
- Advantages & Disadv.

Meaning

- Way of payment which is made through digital modes
- Payer & Payee both use digital modes to send & receive money
- It is also called ELECTRONIC PAYMENT
- No hard cash is involved.

NEW METHODS OF DIGITAL PAYMENT

- UPI Apps
- IMPS
- Mobile App [BHIM]
- Mobile Wallet
- AEPS
- USSD
- Mobile Banking
- Cyp to currency

Added May 2022

- e-Rupi

IFSC = Indian financial System Code
MMID = Mobile Money Identifier
NPCI = National Payments Corporation of India

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UPI Apps
Unified Payment Interface

PhonePe

- UPI has changed banking in terms of moving most of banking to digital Platform
- UPI is a System that powers multiple bank accounts several banking services [like fund transfer] in a single mobile App.
- User need to download app & create UPI ID to use UPI apps.
- UPI Apps Eg- BHIM
  Phone pe

IMPS
Immediate Payment Service

- It is an instant interbank Electronic fund transfer service through mobile phones.
- Safe & Economical method

Mobile Apps
BHIM
Bharat Interface for Money

- BHIM is a mobile App developed by NPCI*
- It is UPI based
- It enables users to send/receive money to other UPI address by scanning QR Code or MMID

App ✓ Scan QR Code

App ✗ IPSC / MMID

Mobile Wallets

paytm

- Digital version of physical wallet
- User can add money to purchase P&S & transfer money too
- Also give additional Cashback offers
- Eg Paytm, Freecharge

AEPS
Aadhar Enabled Payment Service

- It is an Aadhar based digital payment mode
- Customers will need to link their Aadhar number with their bank A/c.
- AEPS once launched can be used at POS terminals also.
- All banking txns such as balance Enquiry, Cash transfer, deposit can be done.

USSD
Unstructured Supplementary Service Data

- No need of Internet, Smart phone
- *99# Banking is a mobile banking based digital payment mode
- Use for checking balance, sending money, getting MMID.

Mobile Banking

- Service provided by bank that allows its customers to conduct financial txns
- It uses S/w called app for the txns
- Each Bank provides its own mobile banking App for Android, iOS etc.

Crypto Currency

- It is a medium of exchange where in records of Individual coin ownership are stored in Computerized database using strong Cryptography
- Strong Cryptography makes it almost impossible to counterfeit or double spend.
- first CryptoCurrency = Bitcoin
  Others Litecoin, Peercoin

Added May 2022

e-Rupi

- Launched by GOI
- Based on UPI
- Ensures seamless t/fr of benefits to citizens in a 'LEAK-PROOF' manner
- It is an e-voucher, will be delivered to the beneficiaries in the form of — QR or
  — SMS
  through which funds would be t/fred to their bank A/c
- Therefore, these vouchers are PERSON & PURPOSE specific.

TRADITIONAL METHODS OF DIGITAL PAYMENT (AMENDED MAY 2021)

- Cards
  - Credit Card
  - Debit Card
  - Smart Card
- Internet or Net Banking. [Customers login to his/her bank a/c. & makes payment]

Credit Card	• Small plastic card allowing the holder to buy P&S on credit • It contains unique numbers linked with an A/c. • It has magnetic strip embedded inside, which is used to read credit card
Debit Card	• same as above but not on credit • Major diff b/w debit & credit card is, in case of debit card, amount gets deducted from card's bank A/c immediately & there should be sufficient balance for deduction whereas in credit card it is not so.
Smart Card	• Similar to Credit/Debit Card in appearance but it has a small microprocessor chip embedded • These are not linked to any bank A/c • After loading money onto the card, the cardholder can use the card to spend upto the limit of loaded amt. • Cardholder can reload if required.

(AMENDED MAY 2021)

ADVANTAGES	DIS-ADVANTAGES
i Easy & Convenient (Cash Handling में Risk होता है)	i Difficult for a non technical person (such as farmers, workers)
ii Pay/Send money from anywhere	ii Risk of Data theft (Hackers can hack servers & easily get personal information)
iii Discounts from Taxes (Govt Discounts देती रहती है Digital Payments बढ़ावा के लिए)	iii Over spending (One thinks twice before spending from physical wallet)
iv Written Record (No need to note-down)	iv Disputed trxns.
v Less Risk (No one can use without MPIN, PIN or fingerprint)	v) Increased business Costs (for procuring, installing handling technologies)
vi Competitive advantage to business (जो Traditional method (cash) use कर रहा होगा उसके Comparison में)	vi) Necessity of Internet access (Can't be done if Internet connection fails)
vii Environment friendly (Eliminates use of Paper)	

EMERGING TECHNOLOGIES

THEORY QUEEN
SONALI JAIN
(Visiting Faculty of ICAI)

- Virtualization
- Grid Computing
- Cloud Computing
- Mobile Computing
- Green IT / Computing
- BYOD
- Web 3.0
- IOT
- AI
- Blockchain

EIS-SM

Virtualization

- Concept
- Application Areas
- Common types

Concept

- Creating a virtual version of a device or resource, (Server, Network, Storage device, OS)
- The core concept of virtualization lies in partioning which divides a single physical server into multiple logical servers.
- Once the physical server is divided, each logical server can run an OS & Applications independently.
- Users are able to interact with the virtual resource as if it were a real, single, logical resource.
- For example, Partioning of harddrive is considered virtualization because one drive is partitioned in a way to create two seperate hard-drives.

Application Areas (कितने Areas में हमारा Use है)

- Server Consolidation
- Disaster Recovery
- Testing & Training
- Portable Application
- Portable Workspace

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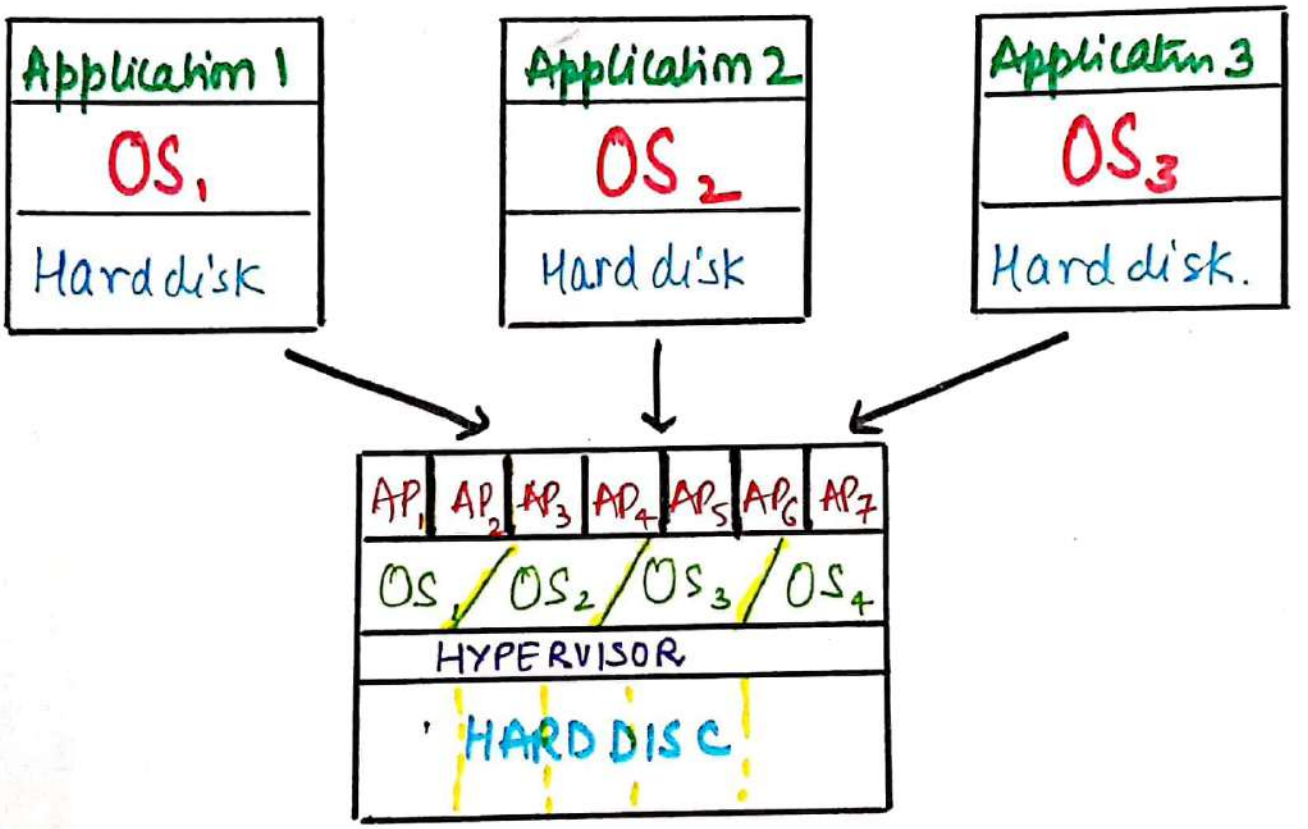
Server Consolidation	• Virtual machines are used to consolidate many physical servers into fewer servers which in turn host virtual machines. • This is also known as "Physical to Virtual" or "P2V" virtualization.
Disaster Recovery	• Virtual M/c can be used as "standby" • Back up can be stored in one-another
Testing & Training	• No need of seperate System for testing any new application
Portable Application	• Portable Applications are needed when running an application from a removable drive, without installing it on the System's main disk drive.
Portable Workspaces	• Recent technologies have used Virtualization to create portable workspace on devices like ipods & USB memory sticks.

Common types

- Hardware Virtualization
- Network Virtualization
- Storage Virtualization

Hardware Virtualization	Network Virtualization	Storage Virtualization
• Many small physical Servers into ↓ 1 huge large physical Server & vice-versa	• Allows multiple smaller LAN to be combined into ↓ 1 larger Network WAN & vice-versa	• Partitioning of Harddisk drive • One HDD is partioned in a way to create seperate hard drives



VIRTUALIZATION

App 1 = Tally
App 2 = SAP
App 3 =

OS_1 = Windows
OS_2 = LINUX
OS_3 =

GRID COMPUTING (AMENDED MAY 2021)

Concept | Benefits | Types of Resources | Application Areas | Security

[AMEND MAY 2021]

Concept

- It is a Computer Network in which each computer's resources are shared with every other computer in the system
- It is a distributed architecture of large no. of computers, connected to solve a complex problem
- In the ideal grid computing system, every resource is shared, turning it into a powerful SuperComputer having enormous processing power & storage capacity
- It is used for high level output at a low level cost
- It has the ability to accumulate the power of geographically scattered & heterogeneous computers (resources) to form a powerful resource & perform high level computations

Benefits

i) Making Use of Underutilized resources
Can be used to aggregate the un-used storage & other resources into useful virtual resources.

ii) Resource Balancing
An unexpected peak can be routed to relatively idle machines in the Grid.

iii) Parellel CPU capacity

The potential for usage of massive parallel capacity of CPU's is attractive feature of grid as well.

iv) Access to additional Resources

Apart from CPU capacity, Grid provides access to other resources as well.

v) Reliability

If one machines get failed, it can be replaced easily.

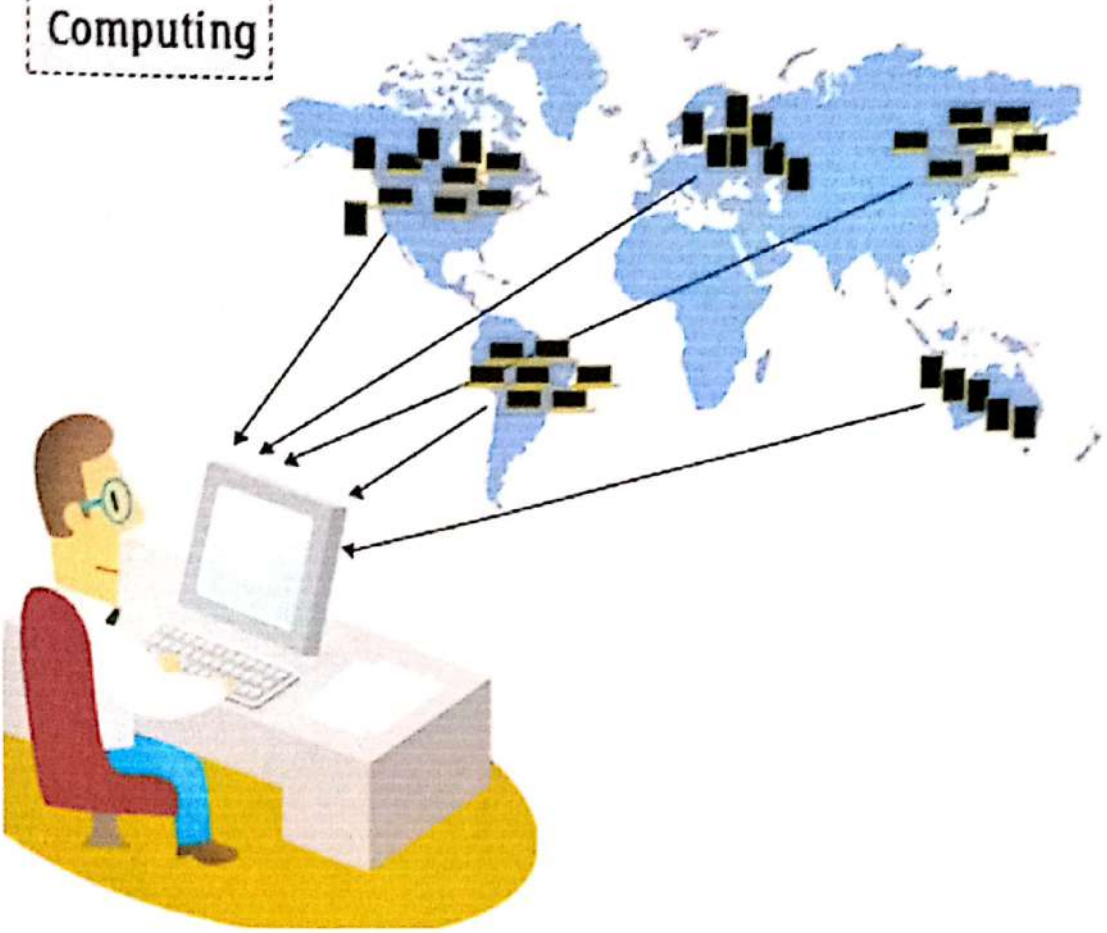
vi) Management

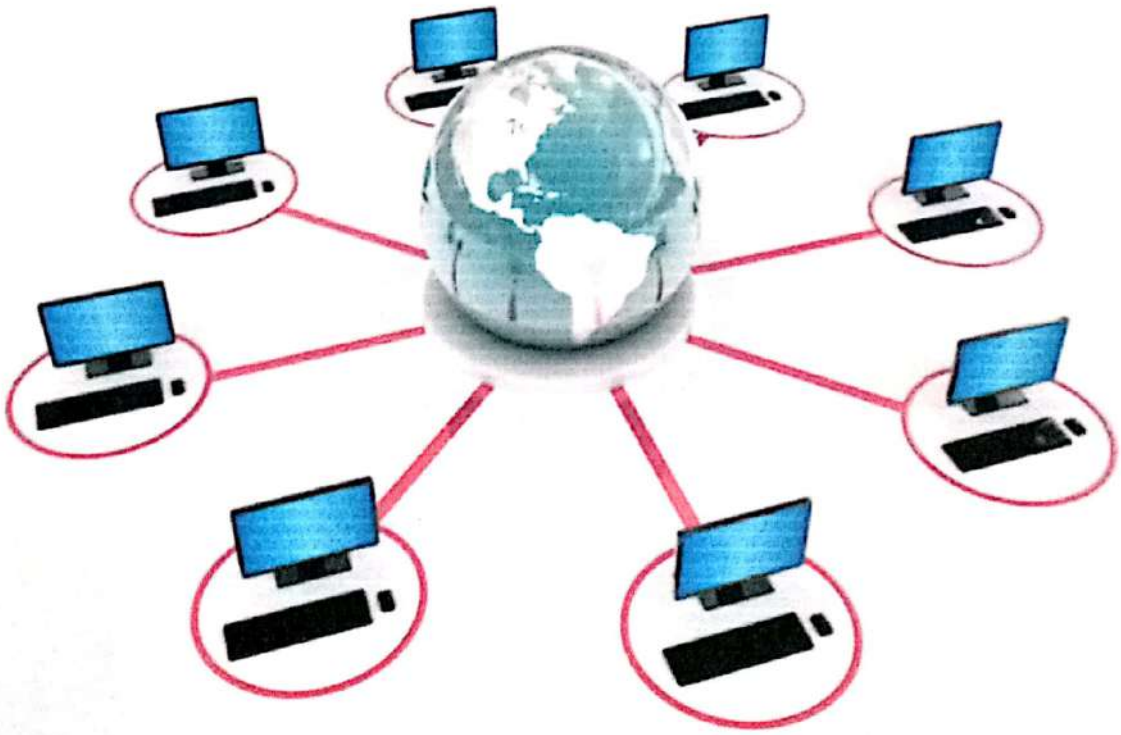
Grid computing helps to manage different projects of larger size with a much larger network.

Types of Resources

i Computation	processor of machines
ii Storage	Hard disk drives or other storage resource
iii Communication	Bandwidth/networking paths
iv Software	Permitting Use of Licensed s/w.
v) Special Capacities	Grid can use Special Capacities of any other resource on the Grid.

Grid Computing





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Application Areas (AMENDED MAY 21)

- Civil Engineers (to do experimental research for analysis of diff models)
- Application Service Provider (for offloading the excess load for computation)
- Enterprise (to support E-business workload)
- Science & Engineering (helps in this)
- Scientific Research (to analyse data)
- Film Industry (to give special effects in movie)
- Financial Industry (to forecast the future of a particular stock)

Grid Computing Security (AMENDED MAY 21)

Secured Single Sign in	A mechanism should be established in which user authenticates only once & able to use them.
Resource Mgt	Grid resources comes from different domains & managing these resources is a big issue
Data Mgt	Providing Secured, Efficient access to pool of data is a big issue

Mgt & Protection of Credentials	Credentials mgt & protection of user's Credentials such as passwords are big issues.
Standardization	Grid Computing involves multi purpose protocols/interfaces & standardizing these is a big issue.
Exportability	Code should be exportable in encrypted form in minimum time.
Support for Secure Group Communicat^{n}	The communication in b/w the resources/nodes involved in Grid must be secure
Support for Multiple Implementations	It should not support single technology rather, it should be possible to implement with a range of secured technologies.

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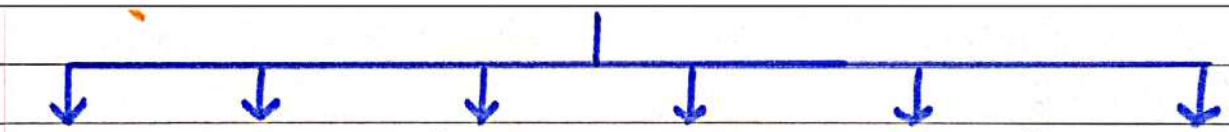
Cloud Computing (AMENDED MAY '21)



- Cloud refers to the applications, services & data storage on the Internet
- There are giant servers & massive storage devices that are connected via Internet.

Concept

- Cloud computing is the use of these giant servers, applications, services & data (Cloud) by individuals/ Organisations

- Cloud computing in other words, simply means, use of computing resources as a service through networks typically the Internet.

- With cloud computing, users can access database resources via Internet from anywhere without worrying about any maintenance or mgt of actual resources.

- It provides facility to access shares resources & common infrastructure offering services on demand over the network to meet the needs of people.

Characteristics (AMENDED MAY 21)

Elasticity & Scalability	- Gives us ability to expand & reduce according to specific service requirement
Pay per Use	- CC services are as per requirement. We pay for cloud when we use them.
On demand	- With CC, there is no need to have dedicated resources. - On demand via Internet we have access
Multi-tenancy	- Public cloud service providers can host the cloud services for multiple users
Resiliency	- Work is migrated to a different Server in the cloud without awareness of such intervention.
Wide Range of Network Access Capabilities	Resources can be accessed by the customers from different devices like mobile, laptop, tablet, desktop.

Advantages

- Reduction in spending [technology Infrastructure]
- Globalise the workforce
- Reduce capital cost [S/W, H/W etc]
- Pervasive accessibility
- Minimized maintenance & Licensing S/W
- Less personnel training is needed.

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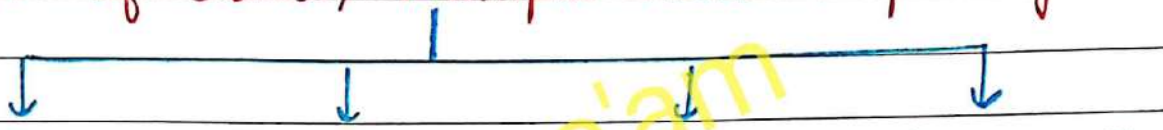
Disadvantage / Drawbacks

- Cannot work without Internet
- Difficult to Control
- Issues wrt Security
- Restrictions on availability sometimes [Server down]

Types of Cloud / Multiple cloud computing



Private Cloud

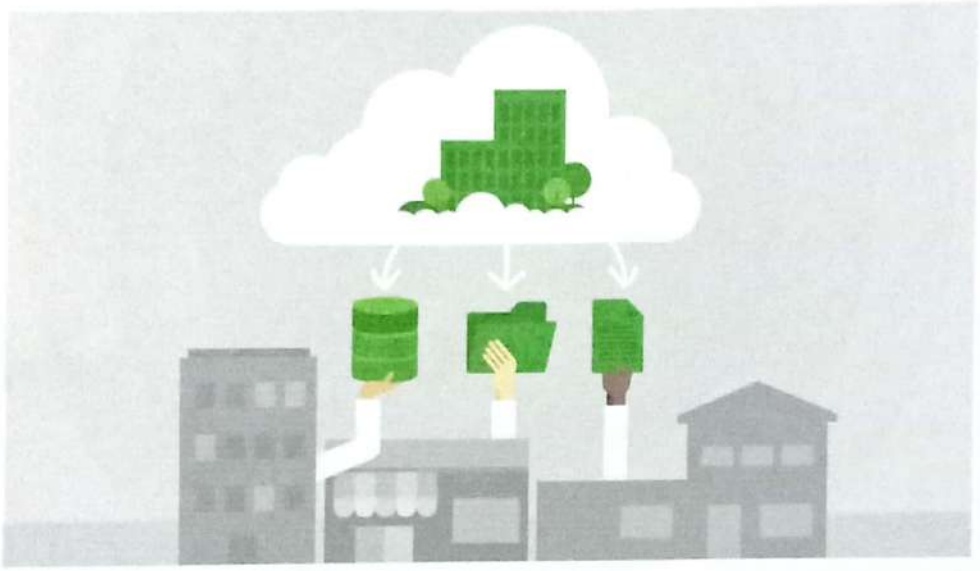
Meaning
- Resides within the Organisation's boundaries
- Used exclusively for Org.
- Can be managed privately or by 3rd party

Characteristics
- Secured क्योंकि हमारे पास Access है
- Central control (हमारा)
- Weak SLA (क्योंकि हम ही Service Provider है)

Advantages
- Security
- Control

Disadvantages
- Cost ↑ [∵ Budget Contraint]
- Weak SLA

GIANT SERVER'S



Public Cloud

Private Cloud

Public Cloud

Meaning
- It is open - ie open for use to public
- सार्वजनिक एवं निजी इस्तेमाल [govt, pvt business etc.]
- Users are all around the world.
- Generally managed by 3rd party & services are offered on "pay per use basis"

Characteristics
- Highly Scalable (↑ or ↓)
- Affordable
- Less secured
- Highly Available
- Stringent (सख्त) SLA's.

Advantages
- Affordable
- Highly Scalable
- Strict SLA's
- No need to establish infrastructure
- No limit on no. of Users.

Limitation
- Security

Hybrid Cloud

Meaning
- Combination of Pvt & Public cloud.
- A vendor has a pvt cloud & forms partnership with a public cloud provider or vice-versa.

Characteristics
- Scalable (Public)
- Partially Secure
- Stringent SLA's (Public)
- Complex cloud mgt

Advantages
- Highly Scalable
- Better security than Public

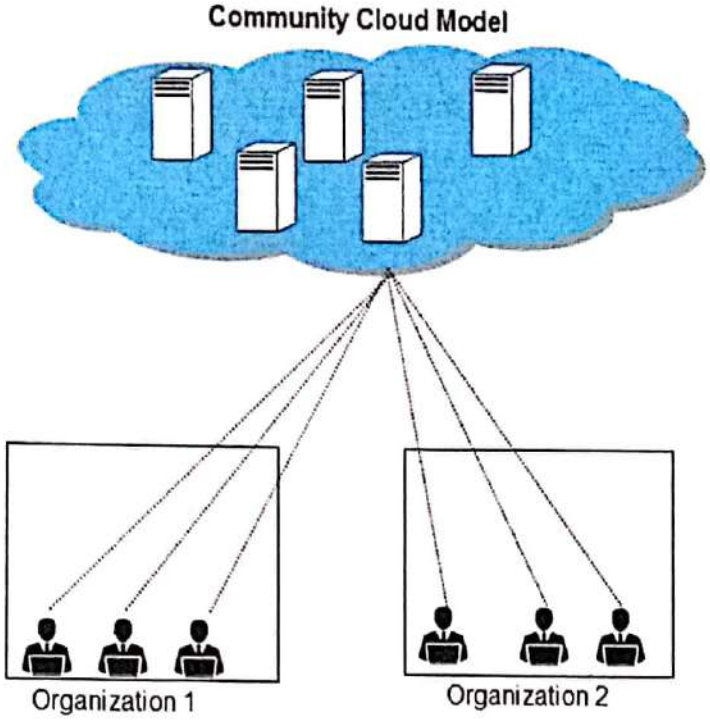
Disadvantages
- Security features are not good compared to Pvt
- Complex mgt

Community cloud

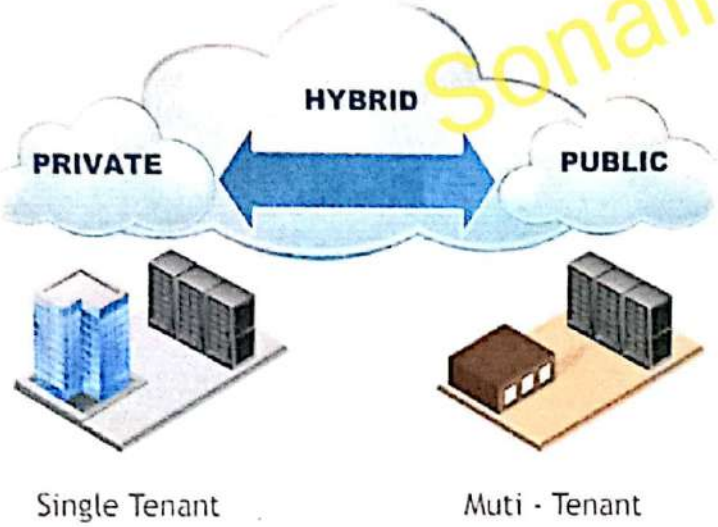
Meaning
- For exclusive Use by specific Community.
- Managed by 3rd party or self or combo.
- Suitable for those who cannot rely on Public cloud.

Characteristics
- Distributive maintenance
- Partially Secure
- Cost effective

Advantages
- Establish a low cost private cloud
- Collaborative work on cloud
- Sharing of Responsibility
- Better security than Public



Community Cloud

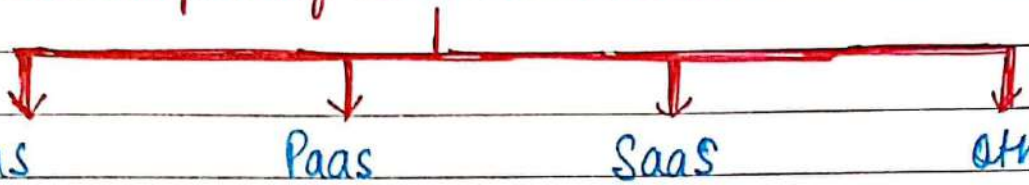


Hybrid Cloud

Cloud Computing Service Models

Disadvantages
- Autonomy Hindrance
- Security is not good as compared to prt
- Not Suitable where there is no collaboration

Cloud Computing Service Models



Iaas

Infrastructure as a Service
- Iaas is a hardware level service
- provides computing resources such as memory, storage, networks for cloud users to run their application on demand
- This allows user to maximise the use of computing capacities without having to own and manage their own resources.
- Different Instances are
  - Network as a Service (NaaS)
  - Storage as a Service (STaaS)
  - Database as a Service (DBaaS)
  - Backend as a Service (BaaS)
  - Desktop as a Service (DTaaS)

Paas — Platform as a Service

- Paas provides the users the ability to develop & deploy an application on the development platform provided by the services provider

- Paas changes the application development from local machine to Online.
- Paas providers may provide pgramming languages, application frameworks, testing tools

Saas — Software as a Service

- Saas provides ability to the end users to access an applications over the Internet that is hosted & managed by Service provider

- Saas is delivered as an on-demand service over the Internet, there is no need to Install the software to the end user's devices

- Different instances of Saas Includes
  - API as a Service (APIaas) [Google maps, Credit card processing
  - Email as a Service (Eaas) (G-mail)
  - Testing as a Service (Taas)

Others

Communication as a Service (CaaS)
Security as a service (SECaaS)
Identity as a Service (IDaaS)
Data as a Service (DaaS)

(ADDED MAY 2021)

PERTINENT ISSUES - RELATED TO CLOUD COMPUTING

Threshold Policy	Quite often, policies does not exist. There is no standard for SLA, there may be services not documented in SLA that customer may be requiring in future
Interoperability	Once a company is locked in the cloud provider of one, it is not easy to move an entire infrastructure to other clouds. as learning new cloud is similar to learning new technology
Hidden Costs	Hidden cost may include network charges for storage & database applications for users located far from cloud service providers
Unexpected Behaviour	An application may perform well at the company's internal data centre. but doesn't mean that it will perform same way in cloud.
Security Issues	The imp security issues with cloud computing. - Mgt of data might not be trustworthy - Risk of malicious insider attacks in cloud - Failing of cloud services - Maintaing Confidentiality
Legal Issues	Users have no control over where their data is physically located & privacy and data security laws varies from country to country.

S/W Development in Cloud	• From the perspective of application development, developers face complexity of building secured applications that may be hosted in the cloud. • The project manager must upgrade App frequently & ensure that applicatn development processes are flexible enough to keep up with the changes/Updation
Bugs in System	Removing errors in these very large scale distributed systems is a challange.

(MC = PUBLISH)

Mobile Computing

Concept | Components | Working | Benefits | Limitations

Concept

- This technology allows transmission of data, voice & multimedia via any wireless enabled device
- This provides biggest solution to the problem of Mobility of business people

Components

Mobile Communicatn	Mobile H/W	Mobile S/W
It includes Infrastructure to ensure communicatn	It includes mobile devices like laptops, Tablet, Smart phones	It is the actual programme that runs on the mobile H/W to meet the needs of User.

Working

1. User Enters or access data using the application on hand-held computing device
2. Using one of several connecting technologies, the new data are transmitted from hand-held to site's information System where files are updated & the new data is accessible to other System User
3. Now both systems have the same Info & are in Sync.
4. The process works the same way starting from other end.

Benefits of Mobile Computing (AMENDED MAY 21)

- Enabled users to work from anywhere as long as they are connected to a network
  Employees can access the organisation's database without being in fixed position.
- Reduced travelling time from diff locations & back
  Employees can access documents / files over a secured channel as if they were on their computer
- Productivity has been enhanced.
  Employees can simply work Efficiently from which ever location they are comfortable & suitable

Employees

- Increased information flow
- Facilitates excellend communication

others

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Limitations of Mobile Computing

Insufficient Bandwidth	Mobile Internet access is generally slower than direct cable connection. Networks are available within range of cell phone towers.
Security Standards	When working mobile, one is dependent on VPN, which can easily attacked through huge no. of inter-connected line.
Power Consumption	Mobile resources rely on battery power which are expensive
Transmission Interferences	Weather, terrain & the range from the nearest signal point can all interfere with signal reception.
Potential Health Hazards	People who use mobile devices while driving is often distracted from driving & thus vunerable to accidents.
Human Interface	Human interface is a requisite with the device. Alternate input methods such as speech recognition require training.

(MC : MOBILE)

M = Man Health Hazard

O = OK Google. (Human Interface)

L = Lack of Security

E = Expenditure on battery

Green Computing

- Concept & Objective
- Best Practices
- Services & Challanges

Concept

- It is the study & Practice of establishing / using
  ↓
  Computer / IT resources
  ↓
  in a more efficient & friendly way.
- This includes designing, manufacturing, disposing of computers, servers with minimum or no impact on Environment.

Objective

- Reduce use of hazardous resources
- Maximise energy efficiency during product lifetime
- Promote recyclability / biodegradability
- It includes implementation of energy efficient CPU's, servers & peripherals as well as reduced consumption & proper disposal of electronic waste (e-waste).

Green computing Best Practices

i) Plan	"Develop a Sustainable Green Comp. Plan • Involve stakeholders for checklists, policies, recommendations • Encourage IT community for using best Practices (consider G.C) • Includes power Usage, paper Consumption (↓) • Recycling old machines (proper planning) • USE CLOUD COMPUTING
ii) Recycle	• E-waste disposal as per guidelines • Safe disposal • End of Life mgt [Recycling options after life] • Manufacturer's recycling Services.
iii) Purchase	"Make Environmentally Sound purchase decisions • Purchase of desktop, Notebooks etc on Envt attributes • Consistent set of design performance criteria • Recognise manufacturers efforts • Use VIRTUALIZATION
iv) Paper	"Reduce paper Consumption • Email • Online marketing • Use both sides of paper • Small margins

Conserve Energy	• LCD • Notebooks rather than desktops • Powes down during CPU inactivity • Web confrencing rather than travelling

Security services & challanges

- How Sustainable computing technology can help the environment.
- Knowing how to Evaluate a client's infrastructure to accomodate green technology
- Learning about the challanges of implementing. Green Security & the best practices is a major hope.

Bring your Own Device (BYOD)

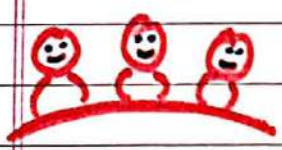
Concept | Advantages | Threats

Concept

- It refers to business policy that allows employees to use their preffered computing devices, like smart phones & laptops for BUSINESS PURPOSES.
- It means employees are welcome to use personal devices to connect to corporate Network.
- It provides flexible workspace [empowering employees to be mobile]

Advantages

- Happy Employees
- Low IT Budgets
- Reduces Maintenance Support
- Early Adoption of New Technologies
- Employee Efficiency ↑



BYOD Threats

Device Risks	"Loss of Device" • Device ही खो सकती है • Resulting in data loss of Org
Network Risks	"Lack of Device Visibility" • IT team is unaware about the no. of devices being connected to Network
Application Risk	"Application Viruses & Malware" • Employees devices may not be protected by security software. • Org is not clear in deciding that "who is responsible for security"?
Implementation Risk	"Weak BYOD Policy" • Weak policy fails to educate the user, thereby increasing vulnerability to the above threats

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↙ Can develop meaning on their own.

Web 3.0 / Semantic Web

- Concept
- Components
- Artificial Intelligence at Latest Use.

Concept

- Web 3.0 is considered as the next logical step in the evolution of the Internet & web technologies
- Uses "data web technology" [Query-able format]
- Consolidation of dynamic web contents depending upon the interest of Individuals.
- It is the latest research in the field of AI.

Components

- Semantic web [Meaning निकालता है]
  - ⇓
  - M/C are able to take contextual decisions on their own by finding, combining & acting upon relevant information
- Web Services [Comp to Comp Interaction करता है without use of human]
  - ⇓
  - Supports Computer to Comp. interaction over the Internet.

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Web 4.0 (ADDED MAY 2020)

- A new concept Web 4.0 called "Intelligent Web" is autonomous, pro-active, self learning & content generating based on matured semantic as well as AI.
- Examples might be services interacting with sensors & implants, natural language services.

Web 5.0 (ADDED MAY 2021)

- Web 5.0, "The Telepathic Web / The Symbionet Web" is set to be highly complex future web generat^ to be present after yr 2030
- Something such as brain implants are expected to be popular.

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Internet of things (IOT)

Definition | Applications | Risks

[Some applications are added from May 2020]

Definition

- It is a System of "Inter-related Computing Devices", "Mechanical & digital Machines", "Objects, animals or people", that are provided with "UNIQUE IDENTIFIERS" & the ability to transfer data over a network, "WITHOUT" requiring Human to Human or Human to Computer interaction

- For example,
  - → Washing Machine connected to Wifi & operated with an app
  - → A.C operated with app [Lyord] [Mi Tv]

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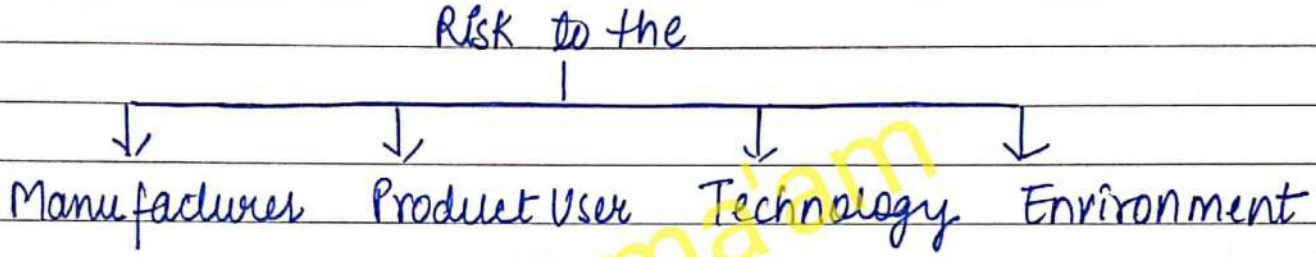
Applications (कहाँ-कहाँ इसको Apply करते है)

Home	• All home appliances to be connected. • Home-owners keep track through Hand-Held devices • Home Security : CCTV Camera
Office	• Office Machines connected through net to have access. • Printouts Generated through Printer.
Governments	• Keep track of Resource Utilization • Under SWACHH mission, dustbin tagged with IOT Sensors.
Individuals	• They got themselves implanted with electronic chips in their bodies. • This chip allows the person to connect to home / office.
	BELOW POINTS ADDED FROM MAY 2020
Wearables	• Just like smart homes, wearables are also potential IOT application. • Eg:- Apple Smart watch
Smart City	• Smart Cities is a BIG INNOVATION • It includes - Traffic mgt, Waste mgt, Environmental monitoring.

Smart Grids	• It extracts information on the behaviour of consumers & electricity suppliers in automated form • Smart meters are MICRO-processor based devices that provide two ways communication capability • So, it improves efficiency, economics & reliability of electricity distribution
Industrial IOT	• Factory equipment containing embedded sensors communicate data about different parameters • Like, pressure, temperature, level etc
Connected Car	• With the use of vast & extensive network comprising of multiple sensors, antennas, IOT will assist to Navigate in the complex would.
Connected Health	• Also called - Digital Health. • Various applications in Healthcare • Advanced & smart sensors allows physicians to keep track of the patient safety & health.
Smart Retail	• Retailers have started using IOT embedded systems & apps. • This has improved store operations, reducing thefts etc.

Smart Supply chain	• Supply chains are also mordernised. • It includes, – tracking of goods on road/transit – Helping suppliers exchange of Information.

Risks



Risk to the Product Mfrer.	• Manufacturers may be out of business in few years (If IOT = necessity) • Manufacturers, also, who are using IOT might have the problem of Hacking / loosing data.
Risk to the Product User	• Products / Home devices shall be hit by all Network Related Risks • Including – Hacking, Virus attacks, etc • Privacy can be stolen. • Hindrance in Autonomy. • Old User may be forced to use new technology.
Technology Risk	• Lack of Technical standards makes the tasks of developing app tough.

	• This is because of a situation where by unmatching situation in Hardware & the differences in softwares running could be traced.
Environmental Risk	• Impact on house air quality, due to use of Heavy earth metals in devices is a being risk to the Environment.

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Artificial Intelligence

Intelligence – Ability to use memory, knowledge, understading, reasoning, imagination to solve problems

Definition

- The ability described above when exhibited by Machines is called AI
- Therefore, It is Intelligence exhibited by machines.
- For example
  " Apple online assistant SIRI is supposed to use it"

Applications

- Automatic vehicles
- Medical diagnosis
- Online Assistant
- Search Engines (Google Search)

Risks

- AI relies on data. Incorrect data → Incorrect output
- Someday machine may start controlling humans. [Use KILL BUTTON].

Machine Learning

- Definition
- Application
- Risk

Definition

- ML is a type of AI
- that provides computers with the ability
- to learn without being explicitly programmed.
- APPLE SIRI is a good example.

Application

- Same as AI

Risk

- Same as AI.

BLOCKCHAIN (ADDED MAY 2022)

Meaning | Working | Application | Risks | Controls

Meaning

Blockchain (referred as DLT) is a
- Shared
- peer to peer
- decentralised *
- Open Ledger of txn System

with
- no trusted 3rd parties in between

having
- permanent database which can't be altered or reversible

* Decentralized network refers to the network which is not controlled by any bank, Corporat^n or Govt

Working

↓ A trxn like Sending money to someone is Init'ated
↓ Txn is broadcasted via network
↓ Network validates txn using Cryptography
↓ txn is represented online as BLOCK
↓ Block is added to existing Blockchain
Transaction is complete.

Application

Financial Services	• Blockchain can be used to provide an automated trade life cycle in terms of txn log of any txn of asset/property. • Eg. automobiles, real estate etc.
Healthcare	• BC provides secure sharing of data by – Increasing privacy, security & – Eliminating 3rd party interference.
Govt	• BC improves transparency where technical decentralizatn is necessary but politically should be governed by Govt. • Eg land registration
Travel Industry	• BC can be applied in money transaction • It can be applied in storing imp documents – like passports – Identification cards
Economic Forecasts	• BC makes possible the financial & economic forecasts based on decentralized predictn markets & stock trading • Thus Enabling the Organisations to plan & shape their businesses.

Risks

- Different members of a particular BC may have diff risk appetite, that can lead to conflict & therefore they may be questions about who is responsible for managing risk & proper accountability
- If the financial txns are tampered, it could render the financial information stored in ledger
- In the absence of any central authority for the administrat^{n}, users can find difficult to obtain understanding of general IT controls & its effectiveness.
- As BC involves data getting updated frequently, risk related to informat^{n} overload could potentially challenge level of monitoring required.

Controls

- Computerized continuous monitoring techniques shall be used to perform evaluations
- Suitable data analytics procedures shall be developed to identify & obtain relevant & quality data from the BC.
- Communicat^{n} methods shall be developed to ensure that operational changes & updates relating to the use of BC are communicated.

- The Unique aspects of B.C such as consensus protocols, smart contracts & private keys of the B.C in use, shall be assessed thoroughly.
- Both Internal & external auditors shall be engaged in discussions during the development or identification of a blockchain.