

IT FOR BUSINESS

COURSE CODE: SGB24BB201SE

Bachelor of Business Administration (Honours)

Skill Enhancement Course

Self Learning Material



SREENARAYANAGURU
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The State University for Education, Training and Research in Blended Format, Kerala

The background features a stylized landscape with rolling hills in shades of yellow and green. On the right side, there is a detailed illustration of a plant branch with several elongated, pointed leaves. On the left side, another similar plant branch is visible. A large, faint, brown watermark with the letters 'SQU' is oriented diagonally across the center of the page.

Vision

To increase access of potential learners of all categories to higher education, research and training, and ensure equity through delivery of high quality processes and outcomes fostering inclusive educational empowerment for social advancement.

Mission

To be benchmarked as a model for conservation and dissemination of knowledge and skill on blended and virtual mode in education, training and research for normal, continuing, and adult learners.

Pathway

Access and Quality define Equity.

IT For Business
Course Code: SGB24BB201SE
Semester - V

Four Year Undergraduate Programme
Bachelor of Business Administration (Honours)
Skill Enhancement Course
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IT FOR BUSINESS

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Semester- V

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Bachelor of Business Administration (Honours)

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MESSAGE FROM VICE CHANCELLOR

Dear Learner,

It is with great pleasure that I welcome you to the Four Year UG Programme in Business Administration offered by Sreenarayanaguru Open University.

Established in September 2020, our university aims to provide high-quality higher education through open and distance learning. Our guiding principle, 'access and quality define equity', shapes our approach to education. We are committed to maintaining the highest standards in our academic offerings.

Our university proudly bears the name of Sreenarayanaguru, a prominent Renaissance thinker of modern India. His philosophy of social reform and educational empowerment serves as a constant reminder of our dedication to excellence in all our academic pursuits.

The Four Year UG Programme in Business Administration covers all relevant areas aligned with management theory and organisational practices. We have incorporated the latest trends in business studies to ensure a comprehensive and up-to-date curriculum. Moreover, the programme encompasses flexible options for learners to choose from a range of Ability Enhancement Courses, Multi-disciplinary Courses, Value Added Courses, and Skill Enhancement Courses, complemented by discipline-oriented Advanced and Additional Advanced Courses.

Our teaching methodology combines three key elements: Self Learning Material, Classroom Counselling, and Virtual modes. This blended approach aims to provide a rich and engaging learning experience, overcoming the limitations often associated with distance education. We are confident that this programme will enhance your understanding of business studies, preparing you for various career paths and further academic pursuits.

Our learner support services are always available to address any concerns you may have during your time with us. We encourage you to reach out with any questions or feedback regarding the programme.

We wish you success in your academic journey with Sreenarayanaguru Open University.

Best regards,



Dr. Jagathy Raj V.P.
Vice Chancellor

01-03-2026

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BLOCK - 01

Introduction to Information Technology in Business

Unit - 1

Overview of Information Technology in Business



Learning Outcomes

After completing this unit, learners will be able to:

- ◇ analyse the fundamental concepts of Information Technology and evaluate its role in business operations .
- ◇ distinguish clearly between data and information with suitable examples.
- ◇ describe databases, DBMS, and data warehousing in business contexts.
- ◇ identify how IT supports different functional areas of business organisations.



Prerequisite

A small cafe owner starts the day by checking handwritten bills from the previous day. By afternoon, she struggles to remember which items sold well, how much stock is left, and whether she made a profit. A few months later, she installed a simple computer system. Now, every sale is recorded automatically, inventory updates in real time, and daily profit reports are generated with a click. The transformation in business operations was primarily enabled by the adoption of Information Technology. This unit introduces learners to how Information Technology acts as the backbone of modern business. Before learning advanced systems, students must understand basic concepts such as data, information, databases, and the role of IT across business functions. This foundational knowledge prepares learners to understand how organisations use IT to improve efficiency, decision-making, and competitiveness in real-world business environments.



Keywords

Information Technology, Data, Information, Database, Decision Making



Discussion

1.1.1 Information Technology (IT)

Picture a retail store at the end of a busy day. Throughout the day, the cashier has recorded hundreds of sales, such as items sold, prices, payment modes, and customer details. If all this information remains scattered on paper slips, it is difficult for the owner to understand:

- a. Which product sold the most?
- b. How much profit was made today?
- c. What stock needs to be reordered?

Now, the same store is using a computer system. Every sale is automatically recorded, stored safely, and summarised into reports such as daily sales, profit statements, and inventory levels. By the evening, the owner can clearly see what happened during the day and decide what to do next. This conversion of raw sales data into useful reports is made possible by Information Technology.

Information Technology (IT) refers to the integrated use of computers, software, networks, databases, and communication systems to collect, process, store, and disseminate information efficiently within organisations. Information Technology enables organisations to transform raw data into structured information that supports planning, control, and decision-making. IT is not just about computers. It includes:

- a. Hardware (computers, servers)
- b. Software (applications, operating systems)
- c. Networks (internet, intranet)
- d. Databases (customer records, sales data)

According to *Management Information Systems* by Kenneth C. Laudon and Jane P. Laudon:

Information Technology consists of all the hardware and software that a firm needs to use in order to achieve its business objectives.



This definition highlights an important point that ‘IT exists to serve business goals, not just to run machines.

Example: A prominent example of effective organisational use of Information Technology is observed in large-scale e-commerce firms such as Amazon . Amazon uses IT to:

- a. Record millions of customer transactions every day
- b. Analyse customer browsing and buying behaviour
- c. Recommend products based on past purchases
- d. Manage warehouses and deliveries efficiently

Placing an order with one click looks simple to a customer; it is actually supported by powerful IT systems working in the background. These systems collect data, process it instantly, and convert it into information that helps Amazon make better business decisions.

Information Technology functions as a central coordinating system that supports information processing and managerial decision-making in modern organisations. It remembers what happened in the past, understands what is happening now, and helps managers decide what should be done in the future. Without IT, managing today’s fast-moving and competitive business environment would be almost impossible.

1.1.2 Importance of Information Technology in Business

In today’s digital economy, Information Technology (IT) plays a central role in the functioning and growth of businesses. Organisations no longer depend only on human effort and paper-based systems; instead, they rely on IT to handle information quickly, accurately, and securely. From small retail shops to large multinational corporations, IT supports almost every business activity, such as communication, accounting, marketing, production, and decision-making. IT helps organisations process large volumes of data and convert them into useful information, which improves efficiency and reduces uncertainty. According to *Management Information Systems* by Kenneth C. Laudon and Jane P. Laudon, information technology enables firms to achieve operational excellence, develop new products and services, improve customer relationships, and make better decisions. Without IT, modern businesses would struggle to compete in a fast-moving, technology-driven market. Accordingly, Information Technology forms a critical infrastructure supporting both operational efficiency and long-term strategic objectives. .

1. Faster Communication

One of the most significant contributions of Information Technology to business is faster and more effective communication. In the past, business communication depended heavily on letters, physical meetings, and telephone calls, which were time-consuming and often costly. Today, IT-enabled tools such as emails, instant messaging, and video conferencing allow employees, managers, suppliers, and customers to

communicate instantly, regardless of their geographical location. This speed improves coordination, reduces delays, and increases productivity. For example, organisations widely use platforms like Microsoft Teams and Zoom to conduct virtual meetings, training sessions, and discussions. A manager can conduct a meeting with team members located in different cities or countries within minutes. Faster communication also improves customer service, as queries and complaints can be addressed quickly. Overall, IT-powered communication helps businesses respond faster to changes, make timely decisions, and maintain strong internal and external relationships.

2. Improved Efficiency

Information Technology greatly improves operational efficiency by automating routine and repetitive tasks. Manual processes are often slow, prone to errors, and require significant human effort. IT systems replace these manual activities with automated processes, ensuring accuracy, speed, and consistency. For instance, payroll software automatically calculates employee salaries, deductions, taxes, and net pay, reducing the chances of human error and saving valuable time. Employees no longer need to manually prepare salary sheets or maintain paper records. Similarly, inventory management systems automatically track stock levels and generate alerts when reordering is required. This automation allows employees to focus on more important and value-adding tasks such as planning, analysis, and customer interaction. According to standard MIS literature, automation through IT leads to higher productivity and better utilisation of organisational resources. Therefore, improved efficiency through IT not only reduces workload but also enhances overall business performance and service quality.

3. Better Decision Making

Effective decision-making is essential for business success, and Information Technology plays a crucial role in supporting managers at all levels. IT systems collect data from various business activities and process it into meaningful reports, charts, and dashboards. These outputs help managers understand trends, identify problems, and evaluate alternatives before making decisions. For example, sales reports generated by IT systems can show which products are performing well and which are not, enabling managers to focus on best-selling items and improve or discontinue poor-performing ones. Data analysis tools also help in forecasting demand, budgeting, and performance evaluation. According to Laudon and Laudon, IT-based information systems reduce uncertainty in decision-making by providing accurate, timely, and relevant information. When decisions are based on reliable data rather than intuition alone, the chances of success increase. Thus, IT enhances the quality, speed, and accuracy of managerial decisions in modern organisations.

4. Cost Reduction

Another major importance of Information Technology in business is cost reduction. IT helps organisations minimise operational costs by reducing paperwork, manual labour, and errors. Digital records replace physical files, saving expenses related to



printing, storage, and maintenance of paper documents. Online billing and electronic invoicing systems eliminate the need for printed bills and postage, significantly reducing administrative costs. Automated systems also reduce the number of employees required for routine tasks, lowering labour costs. Moreover, IT helps reduce costly mistakes by ensuring accuracy in calculations, data entry, and reporting. For example, computerised accounting systems reduce errors in financial statements and tax calculations. Over time, these cost savings improve profitability and financial stability. By investing in IT, businesses may incur initial costs, but the long-term savings and efficiency gains make IT a cost-effective solution for sustainable business operations.

5. Competitive Advantage

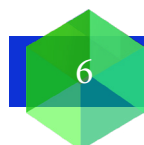
Information Technology provides businesses with a strong competitive advantage by enabling them to operate more efficiently and serve customers better than their competitors. Organisations that adopt advanced IT solutions can introduce innovative products and services, respond quickly to market changes, and deliver superior customer experiences. For example, online retailers use IT to offer faster delivery, personalised product recommendations, and easy return policies. Companies that analyse customer data can understand preferences and tailor their offerings accordingly. This level of customisation builds customer loyalty and increases market share. Businesses that fail to adopt IT often struggle to compete with technology-driven firms. According to MIS theory, IT can be a strategic resource when it supports unique business processes that competitors find difficult to imitate. Therefore, effective use of IT not only improves internal efficiency but also helps businesses stand out in a competitive marketplace.

Business Case: Amazon

A powerful real-world example of the effective use of Information Technology in business is Amazon. Amazon is not just an online shopping website; it is a technology-driven organisation where IT forms the foundation of almost every business activity. One of the most important areas where Amazon uses IT is order processing. When a customer places an order, Amazon's IT systems immediately verify payment, check product availability, assign the nearest warehouse, and schedule packing and delivery, all within seconds. This high-speed processing ensures accuracy and quick order fulfilment.

Amazon also relies heavily on IT for inventory management. Using advanced databases, sensors, and real-time tracking systems, Amazon monitors stock levels across its warehouses worldwide. This helps the company avoid overstocking or stockouts and ensures that popular products are always available. Another major strength of Amazon lies in its AI-based customer recommendation system. By analysing customer browsing history, past purchases, and search behaviour, Amazon's algorithms suggest relevant products, increasing customer satisfaction and sales.

Overall, Amazon's success is largely due to its robust IT infrastructure and data-driven decision-making. By continuously investing in information technology, Amazon has achieved operational efficiency, personalised customer service, and a strong competitive advantage in the global marketplace.



1.1.3 Data vs. Information

Understanding the difference between data and information is very important in Information Technology because all business decisions are ultimately based on information, not raw data. Many students and business users often use these two terms interchangeably, in reality, they are quite different in meaning and usefulness. Information Technology plays a key role in converting data into information that managers can understand and use.

1.1.3.1 Data

Data refers to raw, unprocessed facts and observations generated from organisational activities, which lack context and meaning in isolation.. By itself, Data is unprocessed and unorganised; therefore, it does not convey any clear meaning. Data can be numbers, symbols, text, or simple observations. For example, a list of sales figures such as 100, 250, 400 represents data. These numbers alone do not explain what they relate to, such as whether they represent daily sales, monthly sales, different products, or different locations. Because of this lack of context, data cannot directly support decision-making. In business organisations, large volumes of data are generated every day through transactions such as sales, purchases, attendance, and payments. According to *Management Information Systems*, data is the basic input for information systems, but it has limited value until it is processed. Thus, data can be compared to raw material, which needs further processing before it becomes useful.

1.1.3.2 Information

Information is the result of processing, organising, and analysing data in a meaningful way. When data is arranged, summarised, or interpreted, it gains context and becomes useful for understanding situations and making decisions. For example, the statement “Sales increased by 20% in March compared to February” is information. It clearly explains what happened, when it happened, and how performance has changed. This kind of information helps managers evaluate business performance, identify trends, and plan future actions. Information reduces uncertainty and supports effective decision-making. In business organisations, information is generated through reports, charts, dashboards, and summaries produced by IT systems. While data represents factual inputs, information provides contextualised meaning that supports interpretation and decision-making . Therefore, information is far more valuable than data for managers and decision-makers. In simple terms, data becomes information only when it is processed in a way that adds meaning and relevance.

In summary, data is raw and unorganised, whereas information is processed, meaningful, and decision-oriented. Information Technology acts as the bridge that transforms data into information, enabling businesses to operate efficiently and make informed decisions.

Table 1.1.1 Difference Between Data and Information

Sl.No.	Basis of Comparison	Data	Information
1	Meaning	Raw facts and figures	Processed and meaningful data
2	Nature	Unorganised and unprocessed	Organised and processed
3	Purpose	Serves as input for processing	Used for decision-making
4	Meaningfulness	Has no meaning by itself	Has a clear meaning and context
5	Level of Processing	Not processed	Processed and analyzed
6	Role in IT Systems	Input to information systems	Output of information systems
7	Value to Management	Low value	High value
8	Usage	Rarely used directly for decisions	Actively used for planning and control

Now, let's see the role of Databases in business, which serve as the backbone of information storage and processing.

1.1.4 Database

If the college administration office that maintains student details writes the students' names in one register, students' marks in another file, attendance in separate sheets, and fee details somewhere else, finding complete information about one student becomes time-consuming and confusing. There is also a high chance of errors and duplication. Now imagine that all student-related details, such as name, roll number, marks, attendance, and fee status, are stored together in a computer system. With just a few clicks, the administrator can retrieve or update any student's information accurately. The same data can also be shared with teachers, accounts staff, and management whenever required. This organised and centralised storage of related data in electronic form is known as a database.

A database is an organised collection of related data stored electronically in a computer system in such a way that it can be easily accessed, managed, and updated. Unlike manual records or scattered files, a database keeps data structured and consistent, reducing duplication and errors. Databases are designed to store large volumes of data securely and allow multiple users to access the data simultaneously.

According to *Database System Concepts*:

A database is a collection of interrelated data stored together with minimal redundancy.

This definition highlights two important features of a database: interrelated data and minimal redundancy. Interrelated data means that different pieces of data are connected

to each other, while minimal redundancy ensures that the same data is not unnecessarily repeated. In business organisations, databases act as the foundation for information systems, helping in efficient data storage, retrieval, and decision-making.

Examples of Business Database:

In business organisations, different types of databases are maintained to support various activities, such as:

- a. Customer database – stores customer names, contact details, and purchase history
- b. Employee database – stores employee personal details, salary, attendance, and performance records
- c. Product inventory database – stores product details, stock levels, and reorder information

Example: A well-known company that effectively uses databases is Walmart. Walmart manages millions of products and customers across thousands of stores worldwide. To handle this massive amount of data, Walmart uses advanced database systems to store and manage customer purchases, inventory levels, supplier details, and sales transactions. These databases help Walmart track which products are selling fast, manage stock efficiently, and ensure timely replenishment. By using well-structured databases, Walmart is able to reduce costs, avoid stock shortages, and improve customer satisfaction.

In Simple Terms: A database can be compared to a digital filing cabinet that keeps all related information neatly arranged and easily accessible. Without databases, modern businesses would find it extremely difficult to manage data accurately and efficiently.

1.1.5 Database Management System (DBMS)

Think about a large bank branch that handles thousands of customers every day. Each customer has an account number, balance, transaction history, personal details, loan records, and more. If all this information were stored only in paper files or scattered computer files, it would be extremely difficult to find the right details quickly. Updating balances after every transaction would be slow, and the chances of errors or data loss would be very high. Now imagine that the bank uses a special software system where all customer data is stored in an organised manner. With a few clicks, a bank employee can check an account balance, record a deposit or withdrawal, or update customer details securely. Even if the system crashes, the data can be restored from backups. This software that manages the database efficiently and securely is called a Database Management System (DBMS).

A Database Management System (DBMS) is software that enables organisations to manage data securely, ensure integrity, and support operational and managerial information needs. Instead of users directly accessing raw data files, the DBMS acts as an interface between the user and the database. This ensures that data is stored



systematically, remains accurate, and is protected from unauthorised access.

A DBMS makes it possible for multiple users to access the same data at the same time without conflicts. It also ensures data consistency, meaning that when data is updated in one place, the change is reflected everywhere. According to standard database textbooks such as *Database System Concepts*, DBMS plays a vital role in reducing data redundancy, maintaining data integrity, and improving data security. In modern organisations, almost every information system depends on a DBMS to manage large volumes of business data efficiently.

Some widely used Database Management Systems in business and industry are:

- a. Oracle – used by large enterprises and banks
- b. Microsoft SQL Server – commonly used in corporate and enterprise environments
- c. MySQL – widely used for web-based applications

1.1.5.1 Functions of DBMS

A DBMS performs several important functions in an organisation. It stores large volumes of data efficiently and allows quick data storage and retrieval whenever required. It provides data security by restricting unauthorised access through passwords and user permissions. A DBMS also supports backup and recovery, ensuring that data can be restored in case of system failure. Most importantly, it maintains data consistency and integrity, ensuring that the data remains accurate and reliable across the organisation.

Example: Banks are one of the best examples of DBMS usage. For instance, State Bank of India uses powerful DBMS solutions to store customer account details, track millions of daily transactions, and ensure the highest level of data security. Whenever a customer withdraws money from an ATM or transfers funds online, the DBMS instantly updates the account balance and transaction records. Without a DBMS, such real-time and secure banking operations would not be possible.

A DBMS functions as a structured mechanism for controlling, securing, and managing organisational data. It not only stores data but also protects it, organises it, and makes it available whenever needed. For modern businesses dealing with huge amounts of information, a DBMS is not optional; it is essential.

Another important topic discussed in this unit is Data Warehousing. Let's learn.

1.1.6 Data Warehousing

A large retail chain operating across multiple cities records thousands of transactions every day. Each store generates data related to sales bills, customer purchases, payment modes, discounts, and inventory movement. This information is stored in different operational systems such as billing software, customer databases, and inventory management systems. These systems are efficient for daily operations like billing or

stock updates, but they are not suitable for answering long-term managerial questions.

For example, top management may want to know which products perform better during festival seasons, how customer buying patterns have changed over the last five years, or which region contributes the highest profit. Answering such questions requires historical data collected from all stores and systems, brought together in one place, and organised for analysis. This need leads to the creation of a centralised data storage system that collects data from multiple sources and preserves it for long-term analysis. This centralised analytical system is known as a data warehouse.

A Data Warehouse is a centralised analytical repository that integrates data from multiple operational systems to support strategic analysis and decision-making. Unlike transaction-oriented databases, which are frequently updated, a data warehouse is designed to store historical data in a stable and structured form. This makes it highly suitable for analysing business performance over time.

According to *Data Warehousing Fundamentals*:

A data warehouse is a subject-oriented, integrated, time-variant, and non-volatile collection of data.

The term *subject-oriented* means data is organised around major business areas such as sales or customers. *Integrated* indicates that data from different systems is standardised and combined. *Time-variant* refers to the storage of historical data over long periods, and *non-volatile* means that once data is stored, it is not frequently changed. These features make data warehouses a critical tool for strategic analysis.

1.1.6.1 Purpose of Data Warehousing

The primary purpose of data warehousing is to enable long-term analytical processing, trend identification, and strategic decision support. Organisations use data warehouses to study past performance, identify trends, and support strategic decision-making. Managers rely on data warehouses to prepare forecasts, plan marketing strategies, evaluate customer behaviour, and improve operational efficiency. Data warehouses also support business intelligence tools that convert complex data into easy-to-understand reports and dashboards for top-level management.

Example: Retail organisations are among the largest users of data warehousing. Walmart operates one of the world's largest data warehouse systems. The company stores extensive sales data, customer behaviour data, and seasonal trend information collected from its physical stores and online platforms. By analysing this data, Walmart can predict customer demand, manage inventory efficiently, and optimise its supply chain. This data-driven approach enables Walmart to reduce costs, avoid stock shortages, and maintain a strong competitive position in the retail industry.

In Simple Terms, a data warehouse acts as a long-term memory of the organisation, storing historical data in an organised form. It helps businesses learn from past experiences and use those insights to make informed decisions for the future.



1.1.7 Information Technology in Different Functions of Business

Information Technology plays an important role across all functional areas of a business. Each department uses IT in a different way, but the common objective remains the same to improve efficiency, accuracy, speed, and decision-making. The following sections explain how IT supports major business functions with relevant examples.

1.1.7.1 IT in Marketing

The marketing function relies extensively on Information Technology to analyse customer data, design targeted strategies, and evaluate market performance. IT enables companies to collect, store, and analyse customer data related to preferences, buying behaviour, feedback, and complaints. One of the most important IT tools used in marketing is Customer Relationship Management (CRM) software. CRM systems help businesses maintain detailed customer profiles and track interactions across multiple channels such as email, social media, and websites. IT is also widely used in online advertising, where digital platforms allow businesses to target specific customer segments based on age, location, and interests. In addition, market research has become faster and more accurate through online surveys, data analytics, and social media monitoring. For example, companies use CRM software to track customer preferences and design personalised marketing campaigns. Firms like Salesforce provide CRM solutions that help organisations improve customer satisfaction and loyalty through data-driven marketing.

1.1.7.2 IT in Finance

The finance function uses Information Technology to ensure accuracy, compliance, financial control, and real-time financial reporting. Information Technology has greatly simplified financial operations by replacing manual bookkeeping with computerised systems. Accounting software helps organisations record transactions, prepare financial statements, calculate taxes, and ensure compliance with regulations. IT also supports online banking, enabling businesses to transfer funds, make payments, and monitor account balances in real time. In addition, financial analysis tools help managers analyse costs, profits, cash flows, and investment options. These tools generate reports and charts that support financial planning and decision-making. A common example of IT in finance is the use of Tally software for preparing balance sheets, profit and loss accounts, and tax returns. By using IT in finance, organisations reduce errors, save time, and improve financial transparency.

1.1.7.3 IT in Human Resource Management

Human Resource Management (HRM) leverages Information Technology to support workforce planning, performance management, and strategic talent development. Information Technology supports HR activities by maintaining accurate and up-to-date employee records, including personal details, qualifications, attendance, and performance data. IT is extensively used in payroll processing, where salaries, bonuses, deductions, and taxes are calculated automatically, ensuring accuracy and timely

payments. Another important area where IT is used is online recruitment. Organisations post job vacancies on websites and job portals, receive applications electronically, and shortlist candidates using digital tools. HR software systems integrate all these activities into a single platform. For example, many large organisations use the SAP HR module to manage recruitment, training, performance appraisal, and payroll. By using IT in HRM, organisations improve efficiency, reduce paperwork, and enhance employee satisfaction.

1.1.7.4 IT in Production and Operations

The production and operations function is concerned with converting inputs into finished goods or services efficiently. Information Technology plays a critical role in managing inventory, planning production schedules, and maintaining quality standards. Inventory management systems help organisations track raw materials, work-in-progress, and finished goods in real time, reducing wastage and stock shortages. Production planning software helps managers decide what to produce, how much to produce, and when to produce, based on demand forecasts. IT is also used in quality control, where automated systems monitor defects and ensure consistency in production. Many organisations utilise Enterprise Resource Planning (ERP) systems to integrate production, procurement, logistics, and inventory management into a unified system. ERP systems improve coordination across departments and optimise supply chain operations. As a result, IT helps organisations reduce costs, improve productivity, and deliver products on time.

1.1.7.5 IT in Sales and Distribution

Sales and distribution involve delivering products or services to customers efficiently and profitably. Information Technology has transformed this function through e-commerce platforms, online order processing, and digital payment systems. Businesses use IT to manage order tracking, ensuring customers can monitor the status of their orders in real time. Sales forecasting tools analyse past sales data to predict future demand, enabling organisations to plan their inventory and marketing strategies effectively. IT also supports customer service through chatbots, email support, and call management systems. A practical example is the use of online order management systems by Flipkart, where IT enables seamless order placement, payment processing, logistics coordination, and delivery tracking. By using IT in sales and distribution, businesses improve customer satisfaction, expand market reach, and gain a competitive advantage.

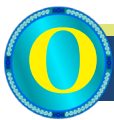


Recap

- ◇ Information Technology helps businesses convert raw data into meaningful information for decision-making.



- ◇ Data is unprocessed facts, while information is processed, meaningful, and useful to managers.
- ◇ Databases and DBMS ensure organised, secure, and efficient data storage and retrieval.
- ◇ Data warehousing supports long-term analysis and strategic decision-making.
- ◇ IT plays a vital role in marketing, finance, HR, production, and sales functions.



Objective Questions

1. Which component stores organised data electronically?
2. What is raw, unprocessed facts called?
3. Which system manages databases?
4. What type of data is stored in a data warehouse?
5. Which business function uses payroll software?
6. What converts data into reports?
7. Which system supports long-term analysis?
8. What type of knowledge is stored in databases?
9. Which IT tool helps customer relationship management?
10. What reduces paperwork in organisations?
11. Which system supports managerial decision-making?



Answers

1. Database
2. Data
3. DBMS

4. Historical data
5. Human Resources
6. Information system
7. Data warehouse
8. Explicit knowledge
9. CRM software
10. Information Technology
11. MIS



Self Assessment Questions

1. Explain the role of Information Technology in modern business.
2. Differentiate between data and information with examples.
3. Describe the importance of databases in business organisations.
4. Explain the functions of a Database Management System.
5. Discuss how IT supports different functional areas of business.



Assignments

1. Study a small retail business and explain how IT can improve its daily operations.
2. Prepare a chart showing differences between data and information with examples.
3. Identify any organisation and list the databases it may be using.
4. Observe the use of IT in your college administration and prepare a brief report.
5. Analyse how IT provides competitive advantage to companies like Amazon or Walmart.





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Unit - 2

Types of Information Systems



Learning Outcomes

After the completion of this unit, the learner will be able to:

- ◇ identify and explain different types of Information Systems used in organisations.
- ◇ distinguish between TPS, MIS, DSS, and KMS based on their purpose and primary users.
- ◇ analyse how Information Systems support operational, managerial, and strategic decisions.



Prerequisite

Consider an online shopping company during a festival sale. Every second, thousands of orders are placed, payments are processed, inventory levels are updated, managers monitor daily sales reports, executives evaluate pricing strategies, and employees share best practices to handle customer complaints. Though these activities appear different, they are interconnected through various information systems working together. This unit introduces learners to the Types of Information Systems used at different levels of management. Understanding how Transaction Processing Systems, Management Information Systems, Decision Support Systems, and Knowledge Management Systems function is essential for business students. This knowledge helps learners see how organisations move from simple data processing to informed decision-making and continuous learning in real business environments.



Keywords

Transaction Processing System, Management Information System, Decision Support System, Knowledge Management System, Decision Making





Discussion

1.2.1 Introduction to Information Systems

A large supermarket chain operates multiple outlets across a city. Every day, cashiers record sales at billing counters, warehouse staff update stock levels, managers review daily performance, and suppliers receive purchase orders. For these activities to run smoothly, several elements work together. Employees enter data into computers, billing software processes transactions, databases store sales and inventory records, and standard procedures guide how reports are generated and shared. Managers then use these reports to decide which products need restocking, which offers are successful, and how sales are performing. This coordinated arrangement of people, technology, procedures, and data forms an Information System. Without such a system, organisational operations may become inefficient, error-prone, and difficult to manage.

An Information System (IS) is an integrated set of components that work together to collect, process, store, and distribute information in order to support business operations, management activities, and decision-making. An information system is not just a computer or a software package; it is a combination of people, hardware, software, data, and procedures. Each component has a specific role, and only when they function together does the system produce meaningful results.

According to *Management Information Systems* by Kenneth C. Laudon and Jane P. Laudon (2020):

An information system is a set of interrelated components that collect, process, store, and distribute information to support decision-making and control in an organisation.

This definition highlights that information systems support both day-to-day operations (such as billing and payroll) and managerial functions (such as planning, control, and performance evaluation). Information systems help organisations reduce uncertainty, improve coordination, and respond effectively to changes in the business environment.

1.2.2.1 Components of an Information System

- a. **People:** People are the most important component of an information system because they design, operate, and use the system. This group includes employees who enter data, managers who use reports for decision-making, and IT staff who maintain and secure the system. Without people, technology cannot be used effectively, no matter how advanced it is.
- b. **Hardware:** Hardware refers to the physical devices used in an information system, such as computers, servers, scanners, printers, and networking equipment. These devices allow data to be entered, processed, stored, and transmitted from one location to another. Hardware provides the physical foundation on which the entire information system operates.

- c. **Software:** Software consists of programs that instruct the hardware on what tasks to perform. This includes operating systems that manage the computer's basic functions and application software that supports specific business activities like accounting, payroll, or inventory management. Without software, hardware would be unable to perform any meaningful work.
- d. **Data:** Data represents raw facts and figures such as sales numbers, customer information, and inventory records that are collected during business operations. This data serves as the input for an information system and is processed to produce useful information. Accurate and relevant data is essential for reliable outputs and effective decision-making.
- e. **Procedures:** Procedures are the rules and guidelines that explain how an information system should be used and maintained. They ensure consistency, security, and proper handling of data by all users. Well-defined procedures help organisations operate systems efficiently and avoid misuse or errors.

Each component of an information system is interconnected and essential. Removing or weakening any one component reduces the effectiveness of the entire system and affects the quality of information produced.

Example: A well-known example of effective use of information systems is Amazon. Amazon's information systems connect millions of customers, sellers, warehouses, and delivery partners worldwide. Its systems collect data from customer orders, process payments, update inventory databases, and generate real-time reports for managers. Employees follow standardised procedures to manage orders and deliveries, while advanced software and hardware handle massive volumes of data. These information systems help Amazon operate efficiently, make data-driven decisions, and maintain tight control over its global operations.

In Simple Terms, an information system can be compared to a coordination mechanism within an organisation. It carries information from one part of the business to another, helps managers understand what is happening, and supports decisions that keep the organisation running effectively and competitively.

1.2.2 Types of Information Systems

Based on the level of management and nature of decisions, information systems are broadly classified into:

1. Transaction Processing System (TPS)
2. Management Information System (MIS)
3. Decision Support System (DSS)
4. Knowledge Management System (KMS)

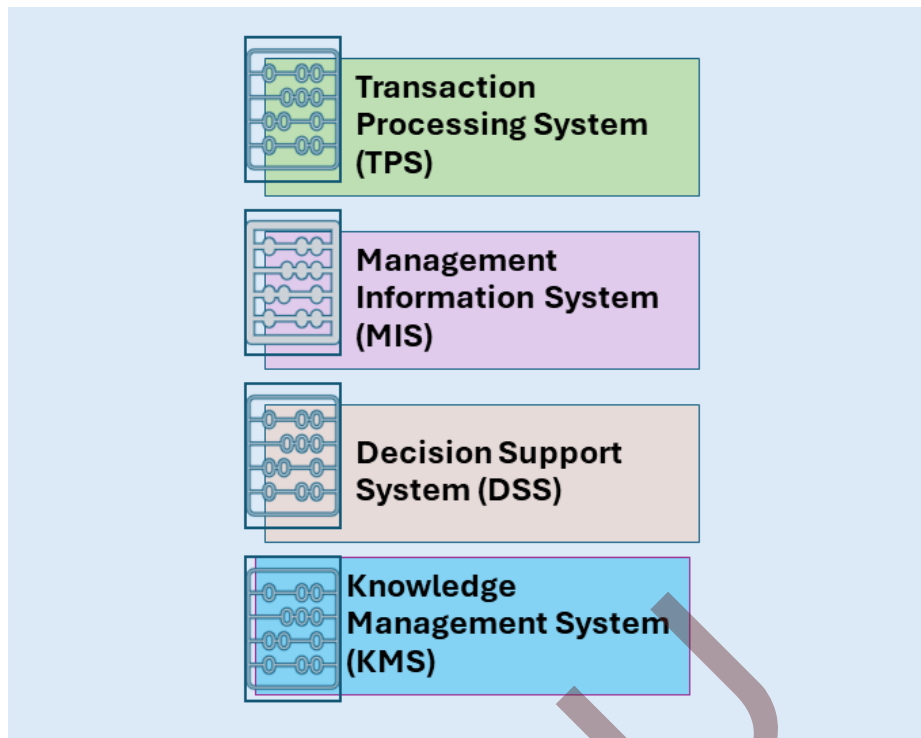


Fig.1.2.1 Types of Information Systems

1.2.2.1 Transaction Processing System (TPS)

A Transaction Processing System (TPS) is one of the most fundamental types of information systems used in business organisations. It is designed to record, process, and store routine, day-to-day business transactions accurately and efficiently. Every organisation, whether small or large, performs numerous transactions daily, such as sales, purchases, payments, and receipts. A TPS ensures that these transactions are captured correctly and processed without delay. According to *Management Information Systems* by Kenneth C. Laudon and Jane P. Laudon, *Transaction Processing Systems are systems that process data generated by day-to-day business transactions*. This highlights that TPS forms the operational backbone of an organisation. Typical examples of transactions handled by TPS include sales orders, purchase orders, salary payments, bank deposits and withdrawals, and billing and invoicing. These systems are characterised by their ability to handle large volumes of data, operate continuously, and deliver high accuracy and reliability, since even small errors can lead to serious financial or operational problems. TPS places strong emphasis on speed and efficiency, as delays in transaction processing can directly affect customer satisfaction and business performance.

A clear real-world example of TPS can be seen in the banking system. Banks rely heavily on TPS to record deposits and withdrawals, update customer account balances instantly, and generate transaction receipts. When a customer withdraws money from an ATM, the system immediately verifies the account, deducts the amount, updates the balance, and records the transaction. All of this happens within seconds due to a robust TPS working in the background. Another classic example is the Indian Railways

Reservation System, which is one of the largest transaction processing systems in the world. It uses TPS for ticket booking, seat availability updates, and fare calculation. Millions of passengers book tickets daily, and the system processes these transactions with high accuracy and reliability. These examples show that TPS is essential for daily operations and provides a key data source for higher-level systems such as MIS and DSS.

Characteristics of Transaction Processing Systems (TPS)

- a. **Handles Large Volumes of Data:** Transaction Processing Systems are designed to handle high volumes of routine transactions with speed, accuracy, and reliability. Business organisations such as banks, retail stores, airlines, and utility companies generate thousands or even millions of transactions on a daily basis. TPS can handle this heavy workload efficiently without slowing down system performance. For example, a supermarket billing system processes hundreds of sales transactions every hour, recording product details, prices, and payment information accurately. The ability to manage such large volumes of data ensures that business operations continue smoothly even during peak periods.
- b. **Highly Reliable and Accurate:** Accuracy and reliability are critical characteristics of a TPS because even a small error in transaction processing can result in financial loss or customer dissatisfaction. TPS systems are designed with strict validation checks and controls to ensure that the data entered and processed is correct. For instance, in banking systems, a TPS ensures that deposits and withdrawals are recorded correctly and account balances are updated accurately. High reliability also means that the system can recover quickly from failures, ensuring data is not lost and transactions are not duplicated.
- c. **Operates Continuously:** Transaction Processing Systems are required to operate continuously, often 24 hours a day, 7 days a week. Many businesses cannot afford system downtime because transactions occur at all times. For example, ATMs, online shopping platforms, and ticket booking systems must be available round the clock to serve customers. TPS systems are therefore designed to support continuous operations with features such as real-time processing, backups, and failover mechanisms to ensure uninterrupted service.
- d. **Focuses on Speed and Efficiency:** TPS places strong emphasis on processing transactions as quickly and efficiently as possible. Customers expect immediate responses when making payments, booking tickets, or withdrawing cash. A delay of even a few seconds can affect customer satisfaction. For example, when a customer makes a digital payment, the TPS processes the transaction instantly and confirms the payment in real time. By focusing on speed and efficiency, TPS helps organisations deliver fast service while maintaining accuracy and reliability.

Example: Banking System

Banking operations represent a classic application of Transaction Processing Systems in high-volume, real-time environments. Banks handle a massive number of routine transactions every day, such as deposits, withdrawals, fund transfers, bill payments, and balance inquiries. A TPS enables banks to record deposits and withdrawals accurately, update customer account balances instantly, and generate transaction receipts for every activity. These processes must be completed in real time, as customers expect immediate confirmation of their transactions.

When a customer withdraws money from an ATM, the TPS first verifies the account details, checks the available balance, authorises the transaction, deducts the amount, and updates the database instantly. At the same time, it generates a receipt and records the transaction for future reference. All these steps are completed within seconds with high accuracy and reliability. Banks depend on TPS because even a small error in transaction processing can lead to financial loss and loss of customer trust. Therefore, TPS forms the operational backbone of modern banking systems and ensures smooth, secure, and continuous banking services.

Case Study: Indian Railways Reservation System (IRRS)

Background

Indian Railways is one of the largest railway networks in the world, transporting millions of passengers every day across thousands of trains and routes. With such a massive scale of operations, managing passenger reservations manually was extremely challenging in the early years. Traditional reservation systems were slow, paper-based, location-bound, and prone to errors such as duplicate bookings and incorrect fare calculations. As passenger numbers increased and expectations for faster service grew, Indian Railways required a robust technological solution to manage reservations efficiently, accurately, and in real time.

Problem

Before the introduction of an advanced computerised system, Indian Railways faced several operational problems. Ticket booking was time-consuming, requiring passengers to stand in long queues at reservation counters. Seat availability information was not updated instantly, leading to overbooking or confusion. Fare calculation for different classes and distances was complex and error-prone. In addition, handling cancellations, refunds, and waiting lists manually increased the workload and reduced service quality. The organisation needed a system that could process millions of routine transactions daily, operate continuously, and ensure accuracy and reliability at all times.

Solution

To overcome these challenges, Indian Railways implemented a Transaction Processing System (TPS) known as the Indian Railways Reservation System (IRRS). This system was designed to computerise and automate the entire reservation process. The TPS records every transaction related to ticket booking, cancellation, seat allocation, and

fare calculation. It integrates data from multiple locations and updates seat availability in real time. By using TPS, Indian Railways ensured that every transaction is processed quickly, accurately, and securely, even during peak travel seasons.

Implementation

The reservation TPS was implemented across railway reservation counters, online booking platforms, and authorized agents. The system processes transactions such as ticket booking, cancellations, upgrades, and refunds in real time. Whenever a passenger books a ticket, the system instantly checks seat availability, calculates the correct fare based on distance and class, confirms the booking, and updates the central database. The system also supports continuous operation, allowing passengers to book tickets online at any time. Backup systems and validation checks ensure data accuracy and system reliability.

Conclusion

The Indian Railways Reservation System is a classic and successful example of a Transaction Processing System in action. By implementing TPS, Indian Railways transformed its reservation process from a slow, manual system into a fast, reliable, and customer-friendly digital service. The system efficiently handles millions of transactions daily with high accuracy, reduces operational errors, improves passenger satisfaction, and supports uninterrupted service. This case clearly demonstrates how TPS forms the backbone of large-scale operational systems and highlights the critical role of information technology in managing complex public services effectively.

1.2.2.2 Management Information System (MIS)

A manufacturing company produces and sells consumer goods through multiple distributors. Every day, large amounts of data are generated through sales transactions, purchase orders, inventory movements, and employee attendance. These day-to-day activities are recorded by Transaction Processing Systems (TPS). However, this raw transactional data by itself is too detailed and voluminous for managers to use directly. Middle-level managers need summarised, structured, and timely information to monitor performance and plan future actions.

For example, instead of looking at thousands of individual sales bills, a sales manager needs a monthly sales report, a comparison of target versus actual sales, or a region-wise performance summary. A system that collects raw data from TPS and converts it into meaningful reports for managers is known as a Management Information System (MIS).

A Management Information System (MIS) is an information system that processes data collected by Transaction Processing Systems and converts it into organised and summarised reports that support managerial planning, control, and decision-making. MIS primarily serves middle-level managers but is also used by senior and operational managers for monitoring and control.

According to *Management Information Systems* by Kenneth C. Laudon and Jane P. Laudon:

MIS is an integrated user-machine system that provides information to support management operations.

MIS focuses on structured decisions, such as budgeting, inventory control, sales analysis, and performance monitoring. It produces routine reports like daily sales summaries, monthly financial statements, inventory status reports, and employee performance reports. These reports help managers compare actual performance with planned targets, identify deviations, and take corrective actions. By providing accurate and timely information, MIS reduces uncertainty and improves the quality of managerial decisions.

MIS plays a crucial role in improving organisational efficiency and control. It helps managers monitor operations, allocate resources effectively, and coordinate activities across departments. Since MIS uses standardised data and reporting formats, it ensures consistency and reliability of information throughout the organisation. MIS also saves managerial time by presenting information in an easy-to-understand form, such as tables, charts, and summaries.

Example: A well-known example of effective use of MIS is Tata Steel. The company uses MIS to generate regular reports on production levels, cost control, inventory status, and sales performance across its plants and markets. These reports help managers track efficiency, control costs, and make informed operational decisions. By relying on MIS, Tata Steel ensures better coordination between departments and maintains control over large-scale operations.

In Simple Words, A Management Information System acts as a bridge between raw data and managerial decisions. It does not replace managers, but it provides them with the right information, at the right time, in the right format, enabling them to manage business activities effectively and efficiently.

Features of Management Information System (MIS)

- a. **Provides Periodic Reports:** One of the key features of a Management Information System is its ability to generate periodic reports regularly, such as weekly, monthly, quarterly, or yearly reports. These reports summarize large volumes of transaction data into concise formats that managers can easily understand. For example, a monthly sales report shows total sales, regional performance, and comparisons with previous months. Such periodic reporting helps managers review progress, identify trends, and evaluate whether organisational goals are being achieved. By providing information at fixed intervals, MIS ensures consistency in planning and control activities.
- b. **Supports Structured Decisions:** MIS mainly supports structured and routine managerial decisions, where the decision-making process follows predefined rules and procedures. Examples include decisions related to inventory reordering levels, employee scheduling, and budget allocation. Since these decisions are

repetitive in nature, MIS uses standard data and fixed report formats to assist managers. By supporting structured decisions, MIS reduces the dependence on intuition and ensures decisions are based on accurate and reliable information.

- c. **Uses Data from TPS:** Another important feature of MIS is that it uses data generated by Transaction Processing Systems (TPS) as its primary input. TPS captures day-to-day business transactions such as sales, purchases, and payments, while MIS processes this data to produce summary reports. This integration ensures that managerial reports are based on actual operational data. As a result, the information provided by MIS is accurate, up-to-date, and relevant for managerial use.
- d. **Helps in Monitoring Performance:** MIS plays a crucial role in monitoring organisational performance by comparing actual results with planned targets. Performance indicators such as sales growth, cost control, productivity, and profitability are regularly tracked through MIS reports. When deviations occur, managers can quickly identify problem areas and take corrective action. This continuous monitoring helps organisations maintain control over operations and improve overall efficiency.

Example: Retail Store

A retail chain provides a clear and practical example of how a Management Information System (MIS) supports managerial decision-making. Every day, each branch of the retail chain generates a large volume of transaction data through billing systems, inventory updates, and customer purchases. While this data is captured by Transaction Processing Systems (TPS), managers cannot directly use raw transaction details for planning and control. MIS converts this data into structured summary reports that present information in a meaningful and easy-to-understand form.

Using MIS, the retail chain can compare monthly sales across different branches to evaluate performance. For instance, management can quickly identify which stores are performing well and which are underperforming. MIS also helps managers identify slow-moving products by analysing sales trends over time. Products with consistently low sales can be promoted, discounted, or discontinued. In addition, MIS assists in controlling inventory costs by providing reports on stock levels, reorder points, and carrying costs. By using MIS reports, managers can reduce excess inventory, avoid stock shortages, and improve profitability. Overall, MIS enables retail organisations to maintain control over operations, improve efficiency, and make informed decisions based on reliable data rather than guesswork.

Case Study: Tata Steel

Background

Tata Steel is one of India's oldest and largest steel manufacturing companies, with operations spread across multiple plants and locations in India and abroad. Steel manufacturing is a complex and capital-intensive process involving large-scale



production, high energy consumption, extensive use of raw materials, and strict quality standards. Managing such large operations requires continuous monitoring of production activities, costs, and overall performance. To support managers at various levels, Tata Steel relies extensively on a well-structured Management Information System (MIS).

Problem

Before the widespread use of computerised management systems, monitoring production efficiency and controlling costs across large plants was a difficult task. Data related to production output, machine utilisation, raw material usage, and expenses was often scattered across departments. Managers found it challenging to get timely and accurate information to identify inefficiencies, cost overruns, or delays in production. Without summarised and standardised reports, decision-making was slow, and corrective actions were often delayed, affecting operational performance.

Solution

To overcome these challenges, Tata Steel implemented a comprehensive Management Information System that collects data from operational systems and converts it into meaningful management reports. The MIS integrates information from production units, finance departments, and supply chain operations. It provides middle-level and senior managers with regular reports on production efficiency, cost analysis, and operational performance. These reports are generated periodically, such as daily, weekly, and monthly, allowing managers to track performance against planned targets.

Implementation

Through MIS, Tata Steel monitors key performance indicators such as output levels, machine downtime, energy consumption, and cost per unit of production. Cost reports generated by MIS help managers analyze expenses related to raw materials, labour, and overhead. When deviations from standard performance or budgeted costs are identified, managers can quickly investigate the reasons and take corrective actions. The standardized format of MIS reports ensures consistency and clarity across departments and locations.

Conclusion

The use of MIS has significantly improved operational control and efficiency at Tata Steel. By providing timely, accurate, and relevant information, MIS enables management to identify deviations from planned performance and take corrective measures without delay. This has helped Tata Steel reduce costs, improve productivity, and maintain high operational standards. The Tata Steel case clearly demonstrates how a Management Information System acts as a vital management tool, supporting planning, control, and continuous improvement in large industrial organisations.

1.2.2.3 Decision Support System (DSS)

A Decision Support System (DSS) is an interactive system that supports semi-structured and unstructured decisions beyond the scope of routine MIS reports. Unlike

routine operational systems, a DSS focuses on analysing complex problems where there is no single correct solution. A DSS combines data from internal sources (such as sales records, financial data, and operational databases) and external sources (such as market trends and economic data) with analytical models, simulations, and specialised tools. This integration enables users to explore different scenarios, compare alternatives, and evaluate possible outcomes before making a final decision.

According to Decision Support Systems concepts, a DSS supports managerial decision-making by providing timely, relevant, and accurate information, along with analytical models that help managers understand problems more clearly. It does not replace human judgment; instead, it enhances decision quality by improving insight, consistency, and efficiency in the decision-making process. Decision Support Systems are widely used in areas such as strategic planning, forecasting, budgeting, and risk analysis, making them an essential tool for modern organisational management.

Characteristics of Decision Support System (DSS)

- a. **Supports complex decisions:** A DSS is designed to support complex, semi-structured, and unstructured decisions where the problem cannot be easily defined or solved using standard procedures. It helps managers analyse complicated situations by providing relevant data and analytical tools.
- b. **Uses “what-if” analysis:** One of the key features of a DSS is its ability to perform *what-if analysis*. This allows decision-makers to change variables or assumptions and observe how these changes affect outcomes, helping them evaluate different alternatives and scenarios before making a decision.
- c. **Flexible and interactive:** A DSS is highly flexible and interactive, allowing users to easily modify inputs, adjust parameters, and explore various decision options. Managers can interact directly with the system without needing technical expertise, making it user-friendly and adaptable to different decision-making needs.
- d. **Assists top-level and middle-level managers:** Decision Support Systems assist managers and analysts at different organisational levels by providing strategic and tactical decision support. They support activities such as planning, forecasting, performance analysis, and policy formulation, helping managers make informed and timely decisions.

Case Study: Air India

Background

Air India is the national airline of India, operating both domestic and international flights. The airline manages a large and complex operation involving multiple routes, aircraft types, fluctuating fuel prices, and varying passenger demand. Due to the dynamic nature of the aviation industry, Air India needs timely and accurate information to support managerial decision-making.



Problem

Air India faced several decision-making challenges, including inefficient route planning, rising fuel costs, underutilization of aircraft, and difficulty in predicting passenger demand. Traditional reporting systems were not sufficient to handle semi-structured and unstructured decisions such as pricing strategies, fleet utilization, and demand forecasting. These issues affected profitability and operational efficiency.

Solution

To overcome these challenges, Air India implemented a Decision Support System (DSS). The DSS was designed to integrate large volumes of operational, financial, and market data with analytical models. It enabled management to perform *what-if analysis*, forecasting, and scenario evaluation to support better decision-making.

Implementation

The DSS was implemented across key functional areas of Air India:

- i. Route planning: The system analysed passenger demand, operational costs, and route profitability to help decide optimal flight routes.
- ii. Fuel cost analysis: DSS evaluated fuel consumption and price trends to control fuel expenses.
- iii. Fleet utilisation decisions: Aircraft schedules, maintenance data, and load factors were analysed to ensure efficient use of the fleet.
- iv. Ticket pricing decisions: DSS supported dynamic pricing by analysing demand patterns, seasons, and competitor prices.
- v. Demand analysis and passenger traffic prediction: Historical data and forecasting models were used to analyse demand patterns and predict future passenger traffic.

Conclusion

The implementation of the Decision Support System significantly improved Air India's decision-making capabilities. Managers were able to make informed, timely, and strategic decisions regarding operations, pricing, and resource utilisation. Overall, DSS helped Air India enhance efficiency, reduce costs, improve service planning, and strengthen its competitive position in the aviation industry.

1.2.2.4 Knowledge Management System (KMS)

A Knowledge Management System (KMS) is an information system designed to help organisations systematically capture, store, share, and use knowledge to improve decision-making, organisational performance, and innovation. It ensures that valuable knowledge is available to the right people at the right time, reducing knowledge loss and duplication of effort. A KMS integrates people, processes, and technology to manage both documented information and human expertise. By organising and

distributing knowledge effectively, organisations can improve efficiency, learning, and competitiveness.

Types of Knowledge

- a. **Explicit Knowledge:** Explicit knowledge refers to knowledge that can be easily documented, stored, and shared. It includes documents, manuals, reports, policies, procedures, databases, and training materials. This type of knowledge is formal and systematic, making it easy to transfer across the organisation using digital systems.
- b. **Tacit Knowledge:** Tacit knowledge is personal, experience-based knowledge that is difficult to formalise or write down. It includes skills, expertise, insights, and know-how gained through experience. KMS supports tacit knowledge sharing through collaboration tools, discussion forums, communities of practice, and knowledge-sharing sessions.

Knowledge Management Systems support the creation, storage, organisation, and dissemination of organisational knowledge. They enable employees to learn from past experiences, share best practices, and apply collective knowledge to solve problems and innovate. As a result, KMS helps organisations enhance productivity, improve decision quality, and maintain a competitive advantage.

Functions of Knowledge Management System (KMS)

- a. **Knowledge sharing :**One of the primary functions of a KMS is to facilitate knowledge sharing among employees. It enables individuals and teams to exchange information, experiences, and expertise through shared databases, collaboration platforms, discussion forums, and intranets. This promotes collaboration and ensures that valuable knowledge is not limited to individuals but is accessible across the organisation. Example: An organisation uses an internal portal or intranet where employees post solutions to common technical problems, allowing others to learn and apply the same knowledge.
- b. **Best practice documentation :** A KMS helps in identifying, documenting, and storing best practices developed through experience and successful projects. By capturing proven methods, procedures, and solutions, organisations can standardise operations, reduce errors, and avoid repeating past mistakes. These documented best practices serve as reference materials for current and future employees. Example: A company documents the best practices followed in completing a successful project and stores them in a shared knowledge repository for future projects.
- c. **Training and learning :** Knowledge Management Systems support employee training and continuous learning by providing access to manuals, training modules, case studies, and expert insights. New employees can learn quickly, while existing employees can upgrade their skills, leading to improved competence and productivity across the organisation.



Example: New employees access online training modules, video tutorials, and standard operating procedures through the KMS to quickly understand their roles.

- d. **Innovation support** : A KMS encourages innovation by enabling employees to share ideas, insights, and creative solutions. By combining existing knowledge with new ideas, organisations can develop innovative products, services, and processes. The system fosters a culture of learning and experimentation, which is essential for organisational growth and competitiveness. Example: Employees use a knowledge-sharing platform to suggest new product ideas or process improvements, which management reviews and implements.

Case Study: Infosys

Background

Infosys is a global information technology and consulting company that delivers software development, IT services, and business solutions to clients across the world. With a large and geographically dispersed workforce, Infosys handles numerous projects simultaneously, each generating valuable knowledge, experience, and best practices. Managing and reusing this organisational knowledge efficiently is critical to maintaining service quality and competitiveness.

Problem

Infosys faced challenges in capturing and sharing project-related knowledge across teams and locations. Valuable expertise gained during projects often remained with individuals or specific teams, leading to knowledge duplication, inconsistent service quality, and avoidable project errors. Training new employees and transferring expertise across global offices was also time-consuming and costly.

Solution

To address these challenges, Infosys implemented a Knowledge Management System (KMS). The KMS was designed to capture both explicit knowledge (documents, reports, best practices) and tacit knowledge (employee expertise and experience). The system provided a centralised platform for knowledge sharing, learning, and collaboration across the organisation.

Implementation

Infosys implemented its KMS across multiple functional areas:

- a. **Sharing project knowledge**: Project documents, solutions, and lessons learned were stored in a centralized repository accessible to employees worldwide.
- b. **Storing best practices**: Proven methodologies, coding standards, and process guidelines were documented and reused across similar projects.
- c. **Training employees worldwide**: The KMS supported employee training through online learning modules, case studies, expert insights, and knowledge forums, enabling continuous learning across global locations.

Conclusion

The implementation of the Knowledge Management System significantly improved operational efficiency at Infosys. By reusing knowledge and best practices, the company reduced project errors, improved service quality, and shortened project delivery times. Overall, the KMS helped Infosys enhance employee learning, maintain consistency across projects, and strengthen its position as a leading global IT services provider.

1.2.7 Comparison of Types of Information Systems

Different types of Information Systems are designed to support various levels of management and organisational activities. A comparison helps in understanding their purpose, users, and how each system contributes to effective decision-making and overall organisational performance.

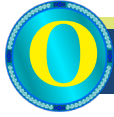
Table 1.2.1 Comparison of Types of Information Systems

Basis	TPS	MIS	DSS	KMS
Users	Operational staff	Middle managers	Top & middle managers	All employees
Nature	Routine	Structured	Semi-structured	Knowledge-based
Output	Transactions	Reports	Analytical insights	Shared knowledge
Focus	Efficiency	Control	Decision support	Learning & innovation



Recap

- ◇ Transaction Processing Systems record and process routine day-to-day business transactions.
- ◇ Management Information Systems convert transactional data into structured managerial reports.
- ◇ Decision Support Systems assist managers in making complex and non-routine decisions.
- ◇ Knowledge Management Systems capture and share organisational knowledge and expertise.
- ◇ Different systems support different management levels but work together as an integrated whole.



Objective Questions

1. Which system records daily business transactions?
2. Which system supports middle-level managers?
3. What type of system performs what-if analysis?
4. Which system focuses on knowledge sharing?
5. Which system uses data from TPS?
6. Which system supports structured decisions?
7. Who are the primary users of TPS?
8. Which system helps in innovation?
9. Which system provides periodic reports?
10. Which system supports semi-structured decisions?
11. Which system stores best practices?
12. Which system supports strategic planning?



Answers

1. TPS
2. MIS
3. DSS
4. KMS
5. MIS
6. MIS
7. Operational staff
8. KMS
9. MIS
10. DSS
11. KMS
12. DSS



Self Assessment Questions

1. Explain the role of Transaction Processing Systems in organisations.
2. Describe the importance of Management Information Systems for managers.
3. Explain the characteristics of Decision Support Systems with examples.
4. Discuss the functions of Knowledge Management Systems.
5. Compare TPS, MIS, DSS, and KMS based on users and outputs.



Assignments

1. Study a retail store and identify the Information Systems used at different levels.
2. Prepare a comparison chart of TPS, MIS, DSS, and KMS with examples.
3. Analyse how a bank uses TPS and MIS in daily operations.
4. Write a brief report on how DSS supports decision-making in airlines or healthcare.
5. Identify an organisation and explain how KMS improves employee performance.



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BLOCK - 02

Information and Communication Technology (ICT)

Unit - 1

Introduction to Information and Communication



Learning Outcomes

After completing this unit, learners will be able to:

- ◇ explain the meaning and significance of Information and Communication Technology (ICT) in modern business operations
- ◇ identify and describe the key components of ICT
- ◇ understand the concept of computer networks and differentiate between major network types
- ◇ describe various network topologies



Prerequisite

A new manager, Riya, joins a retail chain in Kochi. During her induction, she is fascinated by the company's IT systems. She observes how customer details are stored in databases, how dashboards display real-time sales reports, and how transaction systems update inventory every minute. Everything she learned about Information Technology seems to come alive around her.

However, on her very first working day, an unexpected situation unfolds. Just before a busy weekend festival sale, the store's billing system slows down. The POS counters respond late, stock levels do not refresh, and online orders begin to pile up. Customers become impatient, and the operations team struggles to identify the cause. Riya quickly realises that the issue is not with the computers or the software themselves, but with the system that connects all these elements together. The store's Wi-Fi had gone down, preventing devices from communicating with each other and making the cloud-based database temporarily inaccessible.

In that moment, Riya understands an important lesson: even the best IT systems become ineffective if they are not properly connected, communicating and

sharing information. This experience introduces her to the true significance of Information and Communication Technology (ICT).

In the previous units, we explored the “what” of information systems—what IT means, what databases do, and how various information systems support business activities. Now, as we move to this block, our focus shifts to understanding how these systems stay connected and communicate with one another. This unit introduces you to the fundamentals of ICT, its importance in business, its core components, and the basic concepts of computer networks and network topologies.

As Riya watches the network team reset routers, restore connections and bring the cloud systems back online, she realises a deeper truth: IT gives power, but ICT gives life—it carries that power to every corner of a business. By understanding how information flows and how technology connects people and processes, you will begin to see the business world—from a small neighbourhood store to a large multinational corporation—in a more organised, connected and meaningful way.



Keywords

ICT, Information Technology, Data Communication, Hardware, Software, Computer Networks, LAN, MAN, WAN, Network Topology, Bus Topology, Star Topology, Ring Topology, Mesh Topology, Hybrid Topology, Cloud Systems, Connectivity, Communication Technologies.



Discussion

1.1.1 Information and Communication Technology (ICT)

In today’s digital economy, Information and Communication Technology (ICT) is not just a support tool but a strategic enabler in every aspect of business operations. From inventory management to customer service, ICT plays a crucial role in driving efficiency, innovation and global connectivity. Whether it’s an online retail store like Amazon or a traditional bank modernising its services, ICT is at the core of transformation. Therefore, ICT refers to technologies that provide access to information through telecommunications. It includes all digital technology that assists in storing, processing, transmitting and receiving information.

1.1.1.1 Definitions of ICT

Here are a few standard definitions:

- ◇ **UNESCO:** “ICT is a scientific, technological and engineering discipline and management technique used in handling information, its application and association with social, economic and cultural matters.”
- ◇ **OECD (Organisation for Economic Co-operation and Development):** “ICT is a combination of manufacturing and services industries that electronically capture, transmit and display data and information.”

ICT refers to all tools and systems (computers, software, networks, communication devices) used to manage, process and share information.

1.1.1.2 Importance of ICT in Business

1. Business Operations

ICT automates routine and repetitive business processes such as payroll processing, accounting, inventory management and business reporting. This automation reduces manual errors, enhances accuracy and saves time.

Example

- ◇ Tally ERP is used by many Indian SMEs for accounting and GST management. Instead of maintaining manual ledgers, all financial entries are recorded digitally and reports like profit and loss statements or balance sheets are generated in a single click.
- ◇ A retail business using Zoho Inventory can automatically track stock levels, reorder products and get alerts when inventory is low.

Use Case: DMart, a major Indian retail chain, uses integrated ICT systems to manage its entire supply chain, right from warehouse stock to billing at check-out counters. This makes the business operation seamless and scalable.

2. Global Reach

ICT enables businesses to operate beyond geographical boundaries through e-commerce websites, mobile apps and digital marketing strategies. It connects producers with consumers across the world in real-time.

Example

- ◇ Amazon allows Indian sellers to market their products globally via Amazon Global Selling.
- ◇ Small artisans from Rajasthan can sell handicrafts to customers in Europe through platforms like Etsy or their own Shopify stores.

Use Case: Nykaa, a beauty and wellness brand from India, initially operated online

only. Through ICT-enabled e-commerce and targeted digital marketing campaigns on Instagram and Google, it expanded rapidly, reaching a national and eventually global audience.

3. Efficiency & Speed

ICT tools improve communication and coordination, reduce waiting times and enable instant sharing of information and decisions. This increases the overall speed of business operations.

Example

- ◇ Emails, project management tools (like Trello or Asana) and instant messaging apps (like WhatsApp Business) help in task assignment, updates and approvals.
- ◇ Using ERP (Enterprise Resource Planning) systems like SAP or Oracle reduces time in planning and reporting, as all departments are interconnected.

Use Case: A garment export firm in Tirupur adopted SAP Business One ERP. They were able to cut their order fulfilment time by 30% because design, production, procurement and delivery teams could collaborate faster via a central system.

4. Customer Engagement

ICT tools like CRM (Customer Relationship Management) systems, chatbots and social media platforms allow businesses to interact with customers instantly, resolve queries and offer customised support.

Example

- ◇ Chatbots on websites like Zomato or Swiggy help users track orders and raise concerns without speaking to a human.
- ◇ CRM tools like Zoho CRM or Salesforce help businesses store customer data, purchase history, preferences and send personalised emails or offers.

Use Case: JioMart uses ICT-driven customer service platforms integrated with WhatsApp. Customers can place orders, receive updates and get assistance through automated replies—all without downloading an app.

5. Data Analysis

ICT enables businesses to collect, store and analyse large volumes of data (big data). It helps in making evidence-based decisions by identifying customer trends, sales patterns and forecasting demand.

Example

- ◇ Tools like Microsoft Power BI, Google Analytics, or Tableau help visualise data for marketing, sales, or operations.
- ◇ A café can track which items sell most in the evening and offer combo discounts accordingly.



Use Case: Flipkart uses advanced data analytics to track user behaviour on its platform, like which product categories are clicked most, bounce rates and purchase timing, to optimise product listings and offers.

6. Remote Working

With ICT tools, employees can collaborate, communicate and perform tasks remotely. This allows businesses to function during disruptions (like pandemics) and saves infrastructure costs.

Example

- ◇ Zoom and Google Meet enable virtual meetings.
- ◇ Slack supports real-time collaboration.
- ◇ Cloud services like Google Workspace or Microsoft 365 allow access to shared files, presentations and spreadsheets from anywhere.

Use Case: During the COVID-19 lockdown, Infosys quickly shifted over 90% of its employees to remote working using its ICT infrastructure. This ensured uninterrupted service to global clients without any significant drop in productivity.

Table 1.1.1 Summary of Importance of ICT in Business

Area of Impact	ICT Contribution	Real-Life Example
Business Operations	Automates tasks like payroll, billing, stock management	DMart, Tally ERP
Global Reach	Enables international sales through e-commerce and online marketing	Nykaa, Etsy sellers from India
Efficiency & Speed	Speeds up internal communication, decision-making and workflows	SAP ERP in Tirupur export unit
Customer Engagement	Enables 24/7 support and customised services using chatbots and CRMs	JioMart on WhatsApp, Salesforce CRM
Data Analysis	Analyses trends, customer data and forecasts demand using dashboards	Flipkart's behaviour-based promotions
Remote Working	Supports virtual collaboration and decentralised workforce	Infosys during COVID-19

1.1.1.3 Functions of ICT in Business

1. Communication

One of the most basic and essential functions of ICT is enabling effective communication within and outside the organisation. ICT tools facilitate emails, instant messaging, video conferencing, file sharing and collaborative discussions in real time—breaking geographical barriers.

Example

- ◇ Zoom is used for team meetings, webinars, client presentations and interviews across different locations.
- ◇ Gmail/Outlook are used for internal memos, client updates and official notifications.

Use Case: Infosys uses video conferencing tools and internal communication platforms to connect thousands of global employees across time zones for daily operations and international project collaborations.

2. Data Management

ICT helps businesses collect, store, organise, retrieve and manage data efficiently. This includes employee records, financial data, customer databases, inventory levels and more. The use of databases and enterprise software ensures data is stored securely and is easily accessible when needed.

Example

- ◇ SAP (Systems, Applications & Products) in Data Processing allows large companies to manage everything from HR to supply chains.
- ◇ Oracle ERP systems are used to integrate and monitor finance, procurement and projects in real time.

Use Case: Tata Steel uses SAP ERP to manage production schedules, human resources, inventory and procurement, leading to better resource planning and cost reduction.

3. Security

With rising cyber threats and data breaches, security functions of ICT are crucial. This includes firewalls, antivirus software, encryption, password protection, multi-factor authentication (MFA) and more. These tools protect data integrity, customer privacy and prevent financial fraud.

Example

- ◇ Banks use biometric authentication, OTP systems and firewalls to secure online banking services.
- ◇ Companies use SSL certificates for secure websites and VPNs for remote access.



Use Case: ICICI Bank uses advanced ICT security features such as dynamic pin verification, end-to-end encryption and facial recognition for mobile banking security.

4. Marketing

ICT plays a transformative role in digital marketing—enabling businesses to promote their products and services through SEO (Search Engine Optimization), SEM (Search Engine Marketing), PPC (Pay-Per-Click), email marketing and social media platforms. ICT allows brands to track customer behaviour and create targeted campaigns.

Example

- ◇ Facebook Ads Manager allows businesses to run and monitor ad campaigns based on user interests, location, behaviour and more.
- ◇ Google Analytics helps marketers track website traffic and user activity to refine strategies.

Use Case: Coca-Cola uses ICT-driven data analysis to create personalised ad campaigns. Their “Share a Coke” campaign used data to target specific demographics on Facebook and Instagram, greatly increasing engagement.

5. Transaction Handling

ICT facilitates smooth and secure financial transactions both online and offline. From billing and invoicing to online banking, mobile payments, POS systems and digital wallets, ICT ensures that money flow is traceable, accurate and compliant with tax regulations.

Example

- ◇ POS (Point of Sale) machines in retail outlets accept card payments and generate digital receipts.
- ◇ UPI (Unified Payments Interface) apps like Google Pay, PhonePe and Paytm allow seamless mobile payments.

Use Case: Reliance Retail integrated POS systems in all stores to handle transactions, maintain real-time stock updates and link customer loyalty data with purchases.

6. Infrastructure Support

ICT manages and supports the hardware, software, networking tools, cloud services and data centers that form the technological foundation of a business. It includes the installation, maintenance and upgrading of servers, routers, backup systems and operating platforms.

Example

- ◇ Businesses use Google Cloud Platform (GCP) or Amazon Web Services (AWS) to host websites, applications and data backups.

- ◇ Internal IT departments maintain systems like firewalls, LAN/WAN networks and user devices.

Use Case: Zerodha, India's largest stock brokerage firm, runs its online trading platform Kite on cloud infrastructure with real-time data processing and backup, ensuring millions of trades can happen smoothly during peak market hours.

Table 1.1.2 Summary of Functions of ICT in Business

Function	Explanation	Example Use Case
Communication	Enables internal and external digital communication	Zoom, Gmail, Slack
Data Management	Stores, retrieves and processes business data securely	SAP, Oracle ERP
Security	Protects data using encryption, firewalls and access controls	ICICI Bank's biometric OTP security
Marketing	Uses online channels and tools to promote products	Coca-Cola's Facebook campaigns, Google Analytics
Transaction Handling	Facilitates accurate and secure financial operations	POS terminals, UPI apps like PhonePe
Infrastructure Support	Supports and manages IT systems like cloud platforms, networks and hardware	AWS and GCP for data storage and business applications

1.1.1.4 Components of ICT

1. Hardware

Hardware refers to the physical devices and equipment involved in information and communication technology systems. These include desktops, laptops, servers, routers, switches, printers, scanners, smartphones, biometric devices and point-of-sale (POS) machines.

Example

- ◇ Dell computers are commonly used in office setups for tasks like documentation, communication and design.
- ◇ HP multifunction printers are used in administrative offices for printing, scanning and copying.



- ◇ POS terminals in retail stores like Big Bazaar process transactions and update inventory in real time.

Use Case: Axis Bank equips its branches with biometric machines, ATMs and secure routers to provide banking services, monitor transactions and enhance customer experience.

2. Software

Software consists of programs, applications and operating systems that instruct hardware to perform specific tasks. It includes both system software (like Windows, Linux) and application software (like Microsoft Office, Tally, Photoshop).

Example

- ◇ Microsoft Excel is used for budgeting, data analysis, payroll and inventory control.
- ◇ Tally ERP is used for accounting and GST compliance by many Indian businesses.
- ◇ Autocad is used by architectural firms for digital design.

Use Case: MakeMyTrip uses custom-built software for managing bookings, customer support and dynamic pricing based on demand.

3. Networks

Networks connect multiple ICT devices, allowing them to communicate and share data. These networks include LAN (Local Area Network), WAN (Wide Area Network), Wi-Fi and the Internet. Networking infrastructure includes routers, switches, cables and wireless access points.

Example

- ◇ LAN connects all computers within a corporate office, enabling shared printers and file access.
- ◇ WAN connects branches of an organisation in different cities.
- ◇ VPN (Virtual Private Network) is used for secure access to corporate systems from remote locations.

Use Case: ICICI Bank connects its ATMs, branches and headquarters using WANs, ensuring consistent data access and customer service.

4. Cloud Computing

Cloud computing refers to storing and accessing data and software over the Internet instead of local servers or hard drives. It enables remote working, scalability and data backup with minimal infrastructure cost.

Example

- ◇ Google Drive stores files and allows team collaboration in real-time.
- ◇ Dropbox is used for project file sharing in media and design firms.
- ◇ Amazon Web Services (AWS) provides businesses with scalable cloud servers and application hosting.

Use Case: Zomato hosts its customer database, analytics tools and user interface on cloud platforms to handle millions of users simultaneously.

5. Security Systems

Security systems in ICT safeguard information from unauthorised access, theft, viruses and cyberattacks. They include firewalls, anti-virus software, encryption tools, biometric systems and access control protocols.

Example

- ◇ McAfee antivirus protects systems from malware and phishing attempts.
- ◇ Firewalls prevent unauthorised access to internal networks.
- ◇ VPNs allow secure data exchange over public networks.

Use Case: Paytm uses multi-level encryption, device tracking and OTP systems to protect user data during digital transactions.

6. Communication Tools

These are tools and platforms that allow people to exchange information in various forms—text, audio, video and files. Communication tools are essential for teamwork, customer service, virtual meetings and project coordination.

Example

- ◇ Slack is used for internal messaging, creating discussion threads by project/team.
- ◇ Microsoft Teams is used for virtual meetings, presentations and document sharing.
- ◇ WhatsApp Business helps small businesses interact with customers and confirm orders.

Use Case: UrbanClap (now Urban Company) uses WhatsApp and IVR tools to confirm bookings, assign service professionals and collect feedback.

7. Databases

Databases are structured collections of data stored electronically. They enable businesses to store, retrieve and manipulate large volumes of information efficiently.



They are managed by Database Management Systems (DBMS) like MySQL, Oracle DB, or MongoDB.

Example

- ◇ A Customer Relationship Management (CRM) system like Salesforce stores customer profiles, past purchases, complaints and feedback.
- ◇ Inventory databases in retail monitor stock levels in real time.
- ◇ HR databases maintain employee records, salaries and performance reviews.

Use Case: Flipkart uses databases to store customer preferences, transaction histories and product searches, enabling personalised recommendations and faster checkout.

1.1.2 What is a Computer Network?

A Computer Network is a system that connects two or more computing devices, such as computers, servers, printers, or mobile devices, to share resources, data and communication tools. This connection can be wired (using cables) or wireless (using radio waves or Wi-Fi).

Example: When a group of office computers shares a single printer or accesses files from a common server, they are said to be connected through a computer network.

1.1.2.1 Importance of Computer Networks in Business

- ◇ Facilitates communication among employees and departments.
- ◇ Enables data and file sharing from central storage.
- ◇ Allows shared access to hardware like printers and scanners.
- ◇ Supports centralised software applications (e.g., ERP, CRM).
- ◇ Enhances data backup and security management.

1.1.2.2 Types of Computer Networks

Computer networks are classified based on their size, purpose and geographical coverage. The three most common types are:

A. LAN (Local Area Network)

A LAN connects computers and devices within a limited area, such as a home, office, or school.

Key Features

- i. High speed (up to 1 Gbps)
- ii. Low cost of setup
- iii. Covers a small area (typically a few kilometres)

Example

- ◇ All computers in a school computer lab connected to a single server form a LAN.
- ◇ An office with 10 desktops, 1 printer and a shared file server.

Use Case: LANs are used in retail outlets, bank branches and corporate offices for internal operations.

B. MAN (Metropolitan Area Network)

A MAN connects computers and networks within a city or a large campus. It is larger than a LAN but smaller than a WAN.

Key Features

- i. Moderate coverage area (up to 100 km)
- ii. Faster than WAN but slower than LAN
- iii. Often used to link different branches within a city

Example

- ◇ A university with multiple campuses in a city connected via fibre-optic MAN.
- ◇ The Kerala State Wide Area Network (KSWAN) connects government offices across districts.

C. WAN (Wide Area Network)

A WAN connects computers and networks across large geographical areas, including countries or continents.

Key Features

- i. Covers thousands of kilometres
- ii. Uses public or leased communication lines (e.g., telephone, satellite)
- iii. Slower and more complex to manage

Example

- ◇ The Internet is the largest WAN.
- ◇ Multinational companies connecting offices in India, the US and Europe via WAN.

Use Case: Banks like SBI connect ATMs, branches and headquarters across the country via WANs.



Table 1.1.3 Types of Network

Type of Network	Coverage Area	Example
LAN	Small/local	Office, School, Bank Branch
MAN	City/metropolitan	University Campus, Government Network
WAN	Country/Global	Internet, MNC Networks, Banking Sector



Fig. 1.1.1 Types of Network

1.1.3 Network Topology

Imagine a large housing society where multiple homes need to get water from a central water tank. Now, how the pipes are arranged to connect the homes to the tank represents network topologies. Therefore, Network Topology refers to the layout or physical arrangement of devices in a network. It describes how devices (called nodes) are interconnected.

1.1.3.1 Types of Network Topology

There's a central water tank on the terrace and it needs to send water to 10 flats. You're the engineer who has to decide how to lay the pipes. Each way you connect the pipes becomes a topology. Now, let's understand various types of network topology.

A. Bus Topology

You run one main pipe (a backbone) from the tank across all flats. Every flat taps into this pipe. That is a single path for data, where all devices share the same route.

- ◇ **Structure:** All devices are connected to a single backbone cable.
- ◇ **Pros:** Simple, cost-effective, easy to implement.

- ◇ **Cons:** Cable failure brings down the entire network.
- ◇ **Example:** Small offices or test labs.

B. Star Topology

You run a separate pipe from the tank to each flat directly. Here, all devices connect individually to a central hub.

- ◇ **Structure:** All devices are connected to a central hub or switch.
- ◇ **Pros:** Easy to troubleshoot, scalable.
- ◇ **Cons:** Failure of the hub affects the whole network.
- ◇ **Example:** Common in modern corporate LANs.

C. Ring Topology

You connect all the flats in a circle and the pipe loops back to the tank. Water flows in one direction, passing through each flat. This means each device connects to two neighbours, forming a closed loop.

- ◇ **Structure:** Devices are connected in a circular fashion. Data travels in one direction.
- ◇ **Pros:** Predictable data transfer.
- ◇ **Cons:** One failure can disrupt the entire loop.
- ◇ **Example:** Some older MAN setups.

D. Mesh Topology

You install pipes from each flat to every other flat. Everyone can share water with anyone. In this type, devices are fully interconnected, offering multiple communication paths.

- ◇ **Structure:** Every device is connected to every other device.
- ◇ **Pros:** High reliability and redundancy.
- ◇ **Cons:** Very expensive and complex.
- ◇ **Example:** Military communication networks, data centres.

E. Hybrid Topology

You use a mix: maybe Star in Building A and Ring in Building B, all connected to the same tank. A hybrid topology means combining various topologies. Real-world networks often combine topologies for efficiency.

- ◇ **Structure:** Combination of two or more topologies.
- ◇ **Pros:** Flexible, adaptable to needs.



- ◇ **Cons:** Complex to design and manage.
- ◇ **Example:** Large enterprises using star + mesh for different departments.

Table 1.1.4 Topologies

Topology Type	Key Feature	Example Use
Bus	Single line connection	Small office lab
Star	Centralised hub	Modern office network
Ring	Circular data flow	Older educational networks
Mesh	Full interconnection	Data centres, military systems
Hybrid	Mixed arrangement	Corporate IT infrastructure

Illustration: A Bank's ICT Network

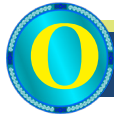
- ◇ **A LAN** connects all computers and printers within a branch.
- ◇ **A MAN** connects all branches within the city.
- ◇ **A WAN** connects branches across the nation.
- ◇ **Star topology** is used at each branch with a central server.
- ◇ **VPN and Firewalls** secure the network.



Recap

- ◇ Information and Communication Technology (ICT) enables the digital creation, processing, storage and sharing of information within a business environment.
- ◇ ICT plays a vital role in modern organisations by enhancing communication, improving efficiency and supporting data-driven decision-making.
- ◇ The major components of ICT include hardware, software, networks, databases, cloud systems and security mechanisms.
- ◇ Computer networks allow devices to connect and share information; the most common network types are LAN, MAN and WAN.
- ◇ Network topology refers to the physical layout of networked devices, with common forms including bus, star, ring, mesh and hybrid topologies.

- ◇ ICT forms the backbone of business functions by ensuring seamless connectivity between people, processes and systems.



Objective Questions

1. What does ICT stand for?
2. Which component of ICT refers to physical devices such as computers and routers?
3. Name the network type that covers a small geographical area like an office or school.
4. In which topology are all devices connected to a central hub or switch?
5. Which network connects devices across large geographical distances, including countries?
6. What does LAN stand for?
7. Give one example of a network topology.
8. Which ICT component includes programs and applications used to perform specific tasks?
9. What does network topology describe?
10. Name any one communication technology used in ICT.



Answers

1. Information and Communication Technology
2. Hardware
3. LAN
4. Star topology
5. WAN



6. Local Area Network
7. Bus / Star / Ring / Mesh / Hybrid (any one)
8. Software
9. The physical layout or arrangement of networked devices
10. Wi-Fi / Router / Switch / Ethernet / Bluetooth (any one)



Assignments

1. Explain the importance of ICT in modern business operations with suitable examples from real-life organisations.
2. Describe the major components of ICT and illustrate how each component supports business activities.
3. Compare LAN, MAN and WAN by highlighting their features, scope and applications in different business contexts.
4. With neat diagrams, explain any three types of network topologies and discuss their advantages and limitations.
5. Visit a local shop, office or institution and prepare a brief report on the ICT tools, networks and communication technologies they use for daily operations.
6. Create a simple chart or table showing the role of ICT in enhancing communication, efficiency and data management within an organisation.
7. Prepare a short note on how network failures affect business processes, using examples similar to Riya's experience in the prerequisite.



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Unit - 2

Role of Internet



Learning Outcomes

After the completion of this unit, the learner will be able to:

- ◇ explain the evolution of the Internet and its significance in the contemporary business environment.
- ◇ identify and describe major internet protocols and understand how they enable communication between devices.
- ◇ distinguish between different internet tools such as search engines, web browsers and electronic mail, and explain their role in business activities
- ◇ understand the functioning and importance of wireless communication technologies in enabling seamless connectivity.



Prerequisite

After the network issues at the retail store were resolved, Riya began paying closer attention to how different parts of the business operated. Over the next few days, she noticed that a huge portion of customer activity did not happen inside the store at all. Instead, orders kept arriving through the company's website, customers sent queries via email and WhatsApp, and social media promotions brought new visitors to the online catalogue. In fact, a significant number of weekend sales were driven entirely by online traffic.

This made Riya realise that even when the store was quiet, the business was still active — but somewhere else. It was active on the Internet.

She watched the IT team analysing website data, responding to customer emails, tracking online payments, and updating product listings. Terms like IP address, secure connection, search ranking, browser compatibility, and wireless access frequently appeared in their conversations. Riya understood that while ICT ensured internal connectivity, the Internet connected the business to customers, suppliers, partners, and the wider world.

Her earlier experience with the Wi-Fi outage had shown her how dependent daily operations were on technology. But now she realised something even deeper: without the Internet, a modern business cannot communicate, operate, or grow.

In the previous unit, you explored how ICT connects devices within an organisation. In this unit, you will understand how the Internet connects an organisation to the outside world. You will learn how the Internet evolved, how communication happens through different protocols, how search engines and browsers help users access information, how email supports daily communication, and how wireless technologies enable constant accessibility.

As Riya navigates website analytics, customer emails, and online order reports, she discovers that the Internet is not just a tool — it is the foundation of modern business communication, marketing, and service delivery. Understanding how it works is essential for every manager in today's digital world.



Keywords

Internet, Evolution of Internet, Internet Protocols, IP Address, TCP, HTTP, HTTPS, SMTP, DNS, Search Engine, Web Browser, Electronic Mail, Cloud Services, Wireless Communication, Wi-Fi, Mobile Internet, VoIP, Online Communication



Discussion

1.2.1 What is the Internet?

The Internet is a global system of interconnected computer networks that use a set of standard communication protocols (called the Internet Protocol Suite) to serve billions of users worldwide. It allows people to share information, access websites, use apps, and communicate across continents.

1.2.1.1 Relevance of the Internet in Business

The Internet is no longer a luxury, it's a lifeline for modern businesses. From local grocery stores to global tech giants, almost every business uses internet-based tools for various core functions. Here's how:

1. Marketing (Social Media, SEO, Paid Ads)

The Internet has revolutionised marketing by enabling businesses to reach their target audience instantly, affordably, and globally. Companies can advertise, engage, and build brand loyalty through digital platforms.



Key Tools & Methods

- ◇ Social Media Marketing (SMM): Platforms like Facebook, Instagram, and LinkedIn allow businesses to run interactive campaigns and build communities.
- ◇ Search Engine Optimisation (SEO): Helps websites rank higher on search engines like Google to attract organic (unpaid) traffic.
- ◇ Pay-Per-Click (PPC) Ads: Google Ads and Meta Ads allow businesses to target specific demographics and locations.

Example

- ◇ A local bakery in Kochi may run Instagram ads with photos of its cakes during festive seasons, bringing in pre-orders.
- ◇ Nike uses global influencer marketing and YouTube ads to promote new product launches.

2. Sales (E-commerce Websites, Online Payments)

The internet facilitates 24/7 sales through online stores. Customers can browse products, compare prices, read reviews, and pay—without visiting a physical outlet.

Key Tools & Platforms

- ◇ E-commerce Websites: Platforms like Shopify, WooCommerce, and custom-built websites host product catalogues and shopping carts.
- ◇ Online Payments: Payment gateways like Razorpay, Paytm, UPI, and credit/debit cards enable secure digital transactions.

Example

- ◇ A handloom saree seller from Kannur uses a Shopify website and Instagram shopping features to sell across India and even to NRIs.
- ◇ Amazon and Flipkart are India's largest internet-driven marketplaces, enabling lakhs of small sellers to reach national customers.

3. Customer Service (Email, Live Chat, Helpdesk)

The internet enhances customer satisfaction through instant support and 24/7 availability. Automated and real-time tools help businesses respond quickly to complaints and queries.

Key Tools & Platforms

- ◇ Email Support: For issue resolution, feedback, or follow-ups.
- ◇ Live Chat: Websites integrate chatbots or agents (e.g., via Tawk.to, Zendesk).
- ◇ Helpdesk Portals: Track complaints, product issues, and support tickets.

Example

- ◇ Swiggy offers live chat support for order tracking and complaints.
- ◇ Tata Cliq uses email and a support portal to handle returns, refunds, and feedback.

4. Data Storage and Access (Cloud Services)

Businesses need to store large volumes of data securely and access it from anywhere. The internet enables this through cloud computing, replacing bulky hardware and local servers.

Key Tools & Platforms

- ◇ Google Drive, Dropbox, OneDrive: For storing files, sharing documents, and collaboration.
- ◇ Amazon Web Services (AWS) and Microsoft Azure: For hosting business applications and large databases.

Example

- ◇ A consulting firm stores client reports and contracts in Google Drive and shares links with clients instead of printing hard copies.
- ◇ Netflix runs on AWS cloud to stream videos to millions of users globally, without owning physical data centres.

5. Internal Communication (Zoom, Teams, Email)

The internet has made it possible for teams to work remotely, flexibly, and efficiently, especially during and after the COVID-19 pandemic. Internal meetings, project updates, and file sharing can all happen online.

Key Tools & Platforms

- ◇ Zoom, Google Meet, Microsoft Teams: For video conferencing, online meetings, webinars.
- ◇ Emails (Gmail, Outlook): Formal communication, memos, notifications.
- ◇ Slack: Real-time messaging, channels, and team collaboration.

Example

- ◇ A marketing agency based in Mumbai holds daily video calls with clients in the US via Zoom.
- ◇ Infosys and TCS use Microsoft Teams to connect project teams across cities and time zones.

1.2.2 Evolution of the Internet – Detailed Timeline

Explanation

1. 1960s – ARPANET: The Birth of Network Communication

Milestone: ARPANET (Advanced Research Projects Agency Network)

The U.S. Department of Defense created ARPANET to develop a decentralised communication system that could withstand attacks or outages. It allowed multiple computers to communicate using packet-switching technology. ARPANET was the first real network to run on packet switching and is considered the grandfather of the modern Internet. This laid the foundation for networked computing, which is now the backbone of business IT infrastructure. The concept of email, file sharing, and remote access started taking shape here.

2. 1970s – Email Introduced: The First Internet Application

Milestone: Email as a communication tool

Programmers developed a way to send text messages between computers connected via ARPANET. Ray Tomlinson is credited with inventing email and introducing the use of the “@” symbol in addresses. Email became the first major use of network communication, allowing users to send and receive digital messages over a network. Email revolutionised business communication. Today, tools like Gmail, Outlook, and Yahoo Mail are essential for customer support, marketing, and internal coordination.

3. 1980s – TCP/IP Adopted: Laying the Internet’s Foundation

Milestone: Standardisation of TCP/IP protocols

The introduction and wide adoption of Transmission Control Protocol (TCP) and Internet Protocol (IP) established a common communication language for computers.

This allowed diverse computer systems to connect and communicate, enabling the creation of a global network. January 1, 1983, is often celebrated as the birthday of the modern Internet when TCP/IP became the standard protocol for ARPANET. TCP/IP is still used today. Without it, services like websites, emails, and video conferencing wouldn’t function. It made the Internet interoperable and scalable.

4. 1991 – World Wide Web (www): Browsing is Born

Milestone: Invention of the World Wide Web by Tim Berners-Lee

Berners-Lee, a British scientist, introduced the World Wide Web, which used hypertext and hyperlinks to navigate between pages. He also created the first web browser and web server.

The www allowed people to access information visually and interactively, marking the transition from a text-based network to a more user-friendly web experience. The WWW is what made the internet commercially viable. Today, every business has a website or web presence—from Amazon and Google to your local bakery.

5. 1995 – Commercialisation: Internet Goes Public

Milestone: Opening the internet for commercial use

The U.S. government lifted restrictions on the Internet, allowing private businesses and individuals to go online. This was the era of dial-up connections and web browsers like Netscape. This marked the beginning of the dot-com boom, where companies began using the internet for commerce, marketing, and customer interaction. Startups like Amazon (1994) and eBay (1995) were born. Businesses began setting up websites, emails, and online advertising, making ICT a business essential.

6. 2000s – Broadband and Wi-Fi: The Internet Gets Faster

Milestone: Introduction of broadband internet and wireless connectivity

DSL (Digital Subscriber Line), cable internet, and Wi-Fi routers replaced slow dial-up connections. Internet speed jumped from kilobits to megabits per second. This allowed users to stream video, download large files, and access rich multimedia content. Wi-Fi made it possible to connect laptops, phones, and printers without wires. E-commerce, online education, and digital media grew exponentially. Companies like YouTube (2005), Facebook (2004), and Flipkart (2007) emerged.

7. 2010s – Mobile Internet and Apps: The Smartphone Era

Milestone: Rise of mobile apps and smartphone-based internet

Widespread adoption of Android and iOS smartphones led to a massive shift from desktop to mobile internet usage. Mobile apps became the new norm. Internet access became ubiquitous and portable. Apps provided customised experiences for shopping, transport, food, entertainment, and communication. Apps like WhatsApp, Uber, Zomato, Instagram, and Paytm transformed how businesses reach and serve customers. Small businesses began using social media for marketing and online orders.

8. 2020s – 5G, IoT, and Cloud: The Connected Future

Milestone: Introduction of high-speed 5G networks, Internet of Things (IoT), and widespread cloud computing.

- ◇ 5G delivers speeds up to 100x faster than 4G.
- ◇ IoT connects everyday objects (like fridges, ACs, and cars) to the internet.
- ◇ Cloud computing enables storing data and running applications remotely on servers.

These technologies allow instant connectivity, real-time data sharing, and smart automation in industries and homes alike.

- ◇ Businesses use cloud platforms like Amazon Web Services (AWS) and Google Cloud for hosting services.
- ◇ Smart cities are deploying IoT devices for traffic, security, and waste management.



- ◇ 5G enables autonomous vehicles, remote surgeries, and virtual reality experiences in business and education.

Table 1.2.1 Evolution of the Internet

Year	Milestone	Real-World Significance
1960s	ARPANET	First computer network – basis for modern Internet
1970s	Email Introduced	First digital communication tool
1980s	TCP/IP Adopted	Standard protocol that made the global internet possible
1991	World Wide Web	User-friendly web browsing and information access
1995	Commercialisation	Businesses and public gained access – birth of e-commerce
2000s	Broadband & Wi-Fi	Faster, always-on connectivity – rise of digital media and services
2010s	Mobile Internet & Apps	App-based services revolutionised consumer behaviour
2020s	5G, IoT, and Cloud	Ultra-fast, smart, interconnected systems across business and society

1.2.3 Internet Protocols

There is a town called Digitalville, where people are always sending letters, photos, and messages to one another. In this town, there is a smart and highly efficient postman named I.P., short for Internet Protocol. His job is to make sure that every message reaches the correct house without getting lost. But to do this, he needs something very important—addresses. Just like every house in Digitalville has a unique address (like 101 Mango Street or 303 Banana Lane), every device connected to the internet—be it a smartphone, a computer, or a printer—has its own unique address called an IP address. This address helps I.P. know exactly where to send the message. So, when Ammu from 101 Mango Street wants to send a photo to her cousin Rahul at 303 Banana Lane, she puts the photo in an envelope, writes Rahul’s address on it, and gives it to I.P. He reads the destination, finds the best route, and ensures that the photo is delivered safely and quickly.

Sometimes, a message or file is too large to carry all at once. In such cases, I.P. cleverly breaks it into smaller packets, writes the destination on each packet, and sends them separately. When all the packets reach Rahul’s house, they are reassembled in the correct order to recreate the original photo. This entire process happens in the background every time we send an email, watch a video, or load a website. However, if Ammu forgets to write Rahul’s address on the envelope, I.P. has no idea where to deliver the message. It simply gets lost. In the same way, if a device does not have an IP address, data cannot reach it. That’s why every device on the internet must have a valid IP address.

In simple terms, the Internet Protocol (IP) is the set of rules that helps send and receive data across the Internet by assigning unique addresses to devices and guiding data to the right destination. Without IP, the internet would be a chaotic place where information would wander aimlessly without ever reaching the right person.

Internet Protocols are rules and standards that define how data is transmitted and received over the internet. Think of protocols as digital languages that enable devices to “understand” each other while exchanging data.

Table 1.2.2 Key Internet Protocols

Protocol	Full Form	Function	Real-Life Example
IP	Internet Protocol	Defines the addressing and routing of data packets to reach the right destination.	When you type www.amazon.in , IP helps direct your request to Amazon’s server.
TCP	Transmission Control Protocol	Ensures reliable, error-free delivery of data between systems.	Used when downloading a file to ensure the whole file is received.
HTTP	Hypertext Transfer Protocol	Transfers web pages from a server to a browser.	Opening a web page like https://www.wikipedia.org .
HTTPS	Secure HTTP	Adds encryption to HTTP for secure transactions.	Online banking, payment gateways (like Razorpay, Paytm).
FTP	File Transfer Protocol	Used to upload/download files between client and server.	Website developers use FTP to update site content.
SMTP	Simple Mail Transfer Protocol	Sends emails from client to server.	Sending an email via Gmail.
POP3 / IMAP	Post Office Protocol / Internet Message Access Protocol	Retrieves emails from the server to your device.	Receiving emails on your phone’s mail app.
DNS	Domain Name System	Translates domain names into IP addresses.	Converts www.google.com into 142.250.182.206.
VoIP	Voice over Internet Protocol	Facilitates voice communication over the Internet.	Zoom, WhatsApp calls, Google Meet.

1.2.3.1 How Protocols Work

To understand how different internet protocols work together, think of it like sending a letter by post. Just like in the postal system, each protocol has a specific role to ensure your message gets delivered accurately, safely, and to the right person.

1. IP (Internet Protocol) = The Address on the Envelope

Just like you can't send a letter without writing the recipient's house address, every message on the internet must include the IP address of the recipient's device. This ensures the data knows where it's going.

Example: IP = "To: 123.456.78.9"

2. TCP (Transmission Control Protocol) = Ensuring the Letter is Delivered Safely

TCP is like the postal service that makes sure the letter isn't lost or damaged, and if the letter is sent in parts, TCP puts them back together in order when it arrives.

Role:

- ◇ Breaks the message into packets.
- ◇ Checks if all packets arrived safely.
- ◇ Resends any lost or corrupted packets.

3. HTTP/HTTPS = The Content Inside the Letter

HTTP (Hypertext Transfer Protocol) or its secure version HTTPS is the actual message inside the envelope—like the contents of your letter. It tells the receiving computer how to read and display the data (like a website, image, or form).

- ◇ HTTP: Used for general web data (not encrypted).
- ◇ HTTPS: Used for secure communication (encrypted), especially in online banking, shopping, and login pages.

4. DNS (Domain Name System) = The Post Office Converting a Name into an Address

When you write a letter to your friend using their name (like "Rahul, Kochi"), the post office must look up their actual address to deliver the letter. That's what DNS does—it translates website names like www.google.com into IP addresses like 142.250.183.68.

DNS = Phonebook of the Internet

It makes browsing easier so you don't have to remember number strings.

1.2.3.2 How to Secure Protocols in Business: Keeping Data Safe

1. HTTPS: Protecting Customer Transactions

In the world of online shopping or banking, HTTPS is essential. It encrypts the data (like passwords or credit card numbers) so that no one can read it even if it's intercepted.

Example: When you make a payment on Amazon or log into your bank account, HTTPS ensures your data is encrypted and safe from hackers.

2. VPN (Virtual Private Network) and IPSec: A Private Highway

VPN is like building a private tunnel through public roads, so your data stays hidden from outsiders. It uses protocols like IPSec (Internet Protocol Security) to:

- ◇ Encrypt the data.
- ◇ Authenticate both sender and receiver.
- ◇ Prevent cyber spying or data theft.

Example: A remote employee accessing a company's database from home over a VPN can work securely without the risk of information leaks.

1.2.4 Search Engine

Your school has a huge library with thousands of books. One day, your teacher asks you to find a book on “Space Exploration.” How would you find the best book quickly? You approach the librarian for the book, and she finds the best-matching book for you. Beyond a librarian, a search engine quickly explores millions of websites, organises their content, chooses the best match for your query, and presents you with the most helpful information.

A search engine is a software system that helps users find information on the internet. It crawls, indexes, and retrieves relevant web pages based on keywords entered by the user.

How Does a Search Engine Work?

Imagine you need to find a specific book in a huge library. How would you find it quickly? You'd probably use the library's catalogue system. Similarly, when you type a query into a search engine (like Google), it quickly finds what you need through four simple steps:

Step 1 : Crawling

Think of crawling like a librarian exploring every book on every shelf. Search engines send automated software called “spiders” or “bots” to continuously visit websites all over the internet. These bots collect information about web pages and follow links from one page to another.

Step 2 : Indexing

Once collected, this information is stored and neatly organised in huge databases, just like the librarian organising books by categories and labels. This step is called indexing. Now, the search engine knows exactly where everything is stored, allowing it to find it quickly later.



Step 3 : Ranking

When you search for something, the search engine uses special formulas known as algorithms to decide which web pages best match your search. These algorithms consider factors like relevance, popularity, content quality, and many more. It's similar to the librarian recommending the most suitable and popular books first.

Step 4 : Results Display

Finally, the search engine shows you the results on your screen, putting the most relevant pages at the top. This is like the librarian handing you the best book at the top of the stack, making it easy for you to find exactly what you're looking for quickly.

Examples

- ◇ Google – The world's most used search engine with over 90% market share.
- ◇ Bing – Microsoft's search engine, integrated with Windows.
- ◇ DuckDuckGo – Focuses on user privacy.
- ◇ Yahoo Search – A legacy engine still used in specific markets.

Use Case in Business: A small Kerala-based tourism company, “Backwater Bliss”, uses search engine optimisation (SEO) techniques to improve its visibility. By optimising their website content with keywords like “houseboat in Alleppey” and “Kerala tour packages”, they attract global tourists who search on Google.

Case Study: How UrbanClap Boosted Customer Acquisition Using SEO and Google Ads

UrbanClap (now known as Urban Company) is an online platform that connects people with service providers like electricians, beauticians, plumbers, and home cleaners. Initially, UrbanClap faced tough competition from other local businesses offering similar services, especially in major cities such as Delhi and Bangalore.

To overcome this challenge, UrbanClap focused heavily on improving its online visibility. They strategically used Search Engine Optimisation (SEO) techniques—such as creating quality content, using relevant keywords (like “home cleaning services in Delhi” or “best electricians in Bangalore”), and building backlinks from trustworthy websites. These practices helped UrbanClap rank higher in Google's organic search results.

Additionally, UrbanClap used Google Ads to display targeted advertisements prominently on Google's first page whenever someone searched for related services. For instance, when users in Delhi typed “AC repair near me,” UrbanClap's ads appeared right at the top, making it easy for potential customers to find and click on their services.

As a result of these SEO practices and effective advertising strategies, UrbanClap's visibility online dramatically improved. Their website started appearing consistently on the first page of Google search results. Consequently, they experienced a significant

increase in website traffic, customer enquiries, bookings, and overall customer acquisition.

Ultimately, by optimising their search engine presence, UrbanClap established itself as a market leader in home and personal services, greatly expanding their customer base in key cities like Delhi and Bangalore.

1.2.5 Web Browser

Imagine you are at home and suddenly crave pizza from your favourite pizza restaurant. To order, you pick up your phone and call the restaurant directly. Here, your phone acts similarly to a web browser, serving as your connection point. Just as you dial the restaurant's number, you type a web address or search term into your browser (like Chrome, Firefox, or Safari). When the restaurant receives your call and takes your order, it is like the browser retrieving information from a website. Finally, when the pizza arrives at your doorstep, it's similar to the webpage loading on your screen, providing the content you requested. Thus, a web browser is essentially a gateway or communication tool that allows you to easily access websites and find information on the internet, just as a phone connects you to services in your everyday life.

A web browser is a software application that allows users to access, retrieve, and view content on the World Wide Web. It acts as a bridge between the user and the internet.

How It Works

- ◇ Takes user input (like a URL or search term).
- ◇ Sends a request to a server via HTTP/HTTPS.
- ◇ Receives and displays the webpage using HTML, CSS, and JavaScript.

Examples of Web Browser

- ◇ Google Chrome – Fast and widely used, with Chrome Web Store extensions.
- ◇ Mozilla Firefox – Known for security and privacy.
- ◇ Microsoft Edge – Comes with Windows; integrates with Microsoft services.
- ◇ Safari – Default browser on Apple devices.

Use Case in Business: A fashion entrepreneur in Mumbai uses Google Chrome to manage her e-commerce store on Shopify, track analytics through Google Analytics, and manage customer service via web-based CRM.

Case Study: Zerodha's Kite—Cross-browser Compatibility for Enhanced User Experience

Zerodha, India's largest and most popular stockbroking firm, has revolutionised the way trading and investments are done in India through its innovative online platform called "Kite." One of Kite's strongest features is its remarkable cross-browser



compatibility, meaning it functions efficiently on all popular web browsers, including Chrome, Firefox, Safari, Edge, and others. This user-friendly approach eliminated the need for traders to download or install separate software applications on their devices, providing effortless access to stock market trading directly through their browsers.

By ensuring compatibility across various browsers, Zerodha's Kite managed to reach a broad and diverse audience. Traders and investors could conveniently track real-time market data, place trades instantly, and monitor their investments seamlessly, irrespective of their browser preference. This ease of access was particularly beneficial for users in India, where internet speeds and hardware capabilities vary greatly from region to region. Because Kite was designed to load quickly and function smoothly even on basic web browsers, Zerodha was able to provide uninterrupted trading experiences to millions of users nationwide.

The practical impact of Zerodha's thoughtful approach became clear as its user base surged rapidly, contributing significantly to its market dominance. Traders appreciated not just the convenience but also the reliability and speed of Kite's web platform, enhancing their overall trading experience. Consequently, Zerodha solidified its position as India's leading brokerage platform, setting a benchmark in customer satisfaction and innovation through strategic investment in cross-browser technology.

1.2.6 Electronic Mail (E-mail)

E-mail is a method of exchanging digital messages between people using electronic devices. It is one of the most widely used forms of business and personal communication today.

How It Works

- ◇ Sender composes a message using a mail client (like Gmail).
- ◇ The message is sent via a Simple Mail Transfer Protocol (SMTP).
- ◇ The recipient retrieves it using POP3 or IMAP protocols.

Examples

- ◇ Gmail – Google's free and business email platform.
- ◇ Outlook – A Microsoft email client used widely in corporates.
- ◇ Yahoo Mail – Offers 1 TB of free storage.
- ◇ Zoho Mail – Business-focused, popular in startups.

Use Case in Business: A startup called EdTech Kerala uses Zoho Mail for internal and external communication. Email is used for everything from sending newsletters and invoices to customer support and recruitment.

Case Study: How TCS Uses Outlook, Teams, and SharePoint for Efficient Collaboration

Tata Consultancy Services (TCS), India's largest IT services company, manages complex projects that involve teams spread across different locations around the globe. To effectively coordinate these diverse teams, TCS relies heavily on enterprise-level email through Microsoft Outlook, a central tool for internal communication, collaboration, and managing project documentation.

By integrating Outlook with collaboration tools like Microsoft Teams and SharePoint, TCS streamlines communication and enhances productivity. While Microsoft Teams enables quick interactions such as video meetings, real-time messaging, and instant file sharing, SharePoint acts as a secure repository for project documents, providing a structured environment for version control and easy access to files. However, email continues to play a pivotal role, especially in formal communication, documentation of critical decisions, and obtaining project approvals, which often require clear, documented evidence.

For instance, when TCS undertakes a global project such as a software implementation across multiple countries, project teams use Outlook to exchange detailed proposals, technical specifications, approval requests, and official communications. Integration with Teams and SharePoint ensures that these emails and related documents can be seamlessly archived and accessed, creating a transparent audit trail. This structured approach significantly reduces confusion, improves accountability, and helps teams adhere to timelines and standards.

Ultimately, by strategically combining Outlook with collaboration platforms like Teams and SharePoint, TCS maintains clear communication channels, effective documentation, and smooth workflow management, ensuring efficient and successful project execution on a global scale.

1.2.7 Role of the Internet in the Contemporary Business World

The Internet has revolutionised the way modern businesses operate. It is no longer a luxury or an optional tool—it is an integral part of business infrastructure, enabling organisations to work faster, smarter, and on a global scale. Whether it's communication, marketing, sales, customer service, or data management, the internet plays a pivotal role in shaping the business landscape.

Let's explore its multifaceted role:

1. E-Commerce and Online Sales

The internet has enabled the digital marketplace, allowing businesses to sell products and services online 24/7.



Example

- ◇ Amazon, Flipkart, and Myntra are Indian examples of online retail giants.
- ◇ Small-scale artisans use Etsy and Shopify to sell handmade goods globally.

Use Case: A home-based entrepreneur in Kerala selling handloom sarees sets up an Instagram shop and links it to a Shopify website. With the help of digital payments and logistics services, she can reach customers across India and even abroad.

Case Study: Nykaa's Online Success Story

Nykaa, one of India's leading beauty and wellness startups, began its journey as an online-only platform founded by entrepreneur Falguni Nayar. When it first launched, Nykaa did not have any physical retail presence; instead, it relied entirely on the power of the internet and digital technology to attract and serve customers nationwide.

Using internet-based marketing strategies, including social media promotions, influencer collaborations, targeted advertising, and content-driven campaigns, Nykaa quickly captured the attention of consumers looking for quality beauty and wellness products. Its user-friendly website and mobile app allowed customers easy access to thousands of products, along with detailed descriptions, reviews, tutorials, and beauty tips. This robust online presence significantly boosted customer engagement and trust, transforming Nykaa into a preferred choice for beauty shopping across India.

In addition to digital marketing, Nykaa effectively leveraged online logistics and distribution networks, enabling quick and reliable delivery even to smaller cities and towns. By carefully managing inventory and partnering with dependable logistics providers, Nykaa could fulfil orders rapidly and efficiently, ensuring customer satisfaction and repeat purchases.

Today, Nykaa has expanded from an internet-only brand to include a chain of physical retail stores, further increasing its consumer base. It has successfully transitioned into a publicly listed company on India's stock exchanges, with its valuation reaching billions of dollars. Nykaa's remarkable growth story highlights the transformative role that the internet and digital business models can play in achieving extraordinary commercial success in contemporary business environments.

2. Digital Marketing and Branding

The internet has changed the face of advertising. Businesses now use digital platforms to promote products through search engines, social media, email campaigns, and influencer marketing.

Tools: Google Ads, Meta Ads (Facebook/Instagram), SEO, content marketing, YouTube.

Use Case: A restaurant in Kochi launches a Facebook campaign with geo-targeting ads for food delivery. Customers within 5 km receive promo codes on their feeds, increasing orders by 30%.

Case Study: How Swiggy and Zomato Use Internet Data to Boost their Business

Swiggy and Zomato, India's leading online food delivery platforms, heavily rely on internet data to grow their businesses and keep customers coming back. These companies collect and analyze user data—such as browsing patterns, favourite cuisines, previous orders, location, and preferences—to create personalised marketing campaigns.

For instance, when a user frequently searches for or orders pizza, Swiggy and Zomato display targeted advertisements offering special discounts or promotions from pizza restaurants in the user's area. They also leverage data to introduce new eateries to users based on their past dining habits. If a new sushi restaurant opens nearby, users who previously browsed or ordered Asian cuisine might receive customised ads or notifications encouraging them to try it.

Moreover, Swiggy and Zomato use this data-driven approach to retain customers. By offering tailored discounts and incentives, like personalised coupon codes or loyalty programs, based on user history and browsing habits, these platforms effectively encourage repeat orders, boosting customer loyalty and satisfaction.

Through intelligent use of internet data, Swiggy and Zomato significantly improve their marketing effectiveness, leading to higher user engagement, increased restaurant visibility, and ultimately, greater business growth and profitability.

3. Business Communication and Collaboration

The internet facilitates instant internal and external communication, ensuring better team coordination, especially in hybrid or remote work environments.

Tools: Email (Gmail, Outlook), video conferencing (Zoom, Google Meet), team chats (Slack, Microsoft Teams), project tools (Trello, Asana).

Use Case: An IT firm with offices in Bengaluru and Kochi uses Slack for daily updates, Zoom for weekly meetings, and Google Drive to collaborate on documents in real-time.

Case Study: Infosys' Transition to Remote Work During COVID-19

When the COVID-19 pandemic struck, Infosys, a leading global IT services firm, faced a major challenge: maintaining operations while ensuring employee safety. To tackle this, Infosys quickly transitioned nearly 90% of its workforce—tens of thousands of employees globally—to remote work arrangements.

Infosys managed this massive shift by leveraging robust cloud platforms and secure communication tools. Cloud solutions allowed employees to access critical data, applications, and software remotely, ensuring continuous workflow and seamless collaboration. Platforms like Microsoft Teams, WebEx, and Zoom became essential for daily interactions, meetings, client presentations, and virtual project management.

Security, a critical concern during remote operations, was addressed through secure VPN connections, multi-factor authentication, and encrypted communication channels.



This ensured sensitive client data and internal communications remained protected despite the dispersed workforce.

Remarkably, despite the scale and rapidity of this transition, Infosys reported no significant disruption in productivity or service delivery. Employees adapted swiftly, thanks to reliable internet-based systems and infrastructure that Infosys had strategically invested in prior to the pandemic.

Ultimately, Infosys' experience highlights the power of cloud computing and internet-based technologies in sustaining large-scale business operations, even under unprecedented conditions. It serves as a strong example of digital preparedness and adaptability in today's rapidly evolving business environment.

4. Digital Payments and Online Transactions

The internet supports secure and quick financial transactions, replacing cash with UPI, credit cards, wallets, and online banking.

Tools: PhonePe, Google Pay, Razorpay, Paytm, Net banking portals.

Use Case: A freelance designer sends an invoice to a client via Razorpay and receives instant payment through UPI. There's no physical meeting, cash handling, or delay.

Case Study: Reliance Retail Boosts Efficiency with Integrated POS Systems

Reliance Retail, India's largest retailer, operates thousands of stores across diverse formats, including supermarkets, electronics outlets, fashion stores, and more. To streamline its operations and enhance customer experience, Reliance implemented advanced Point-of-Sale (POS) systems integrated with real-time online payment tracking across its extensive retail network.

Previously, manual billing processes often caused long queues and delays, leading to customer dissatisfaction, particularly during peak hours or festive seasons. To solve this, Reliance adopted integrated POS solutions connected directly to secure online payment gateways. With these systems, as soon as customers completed transactions via digital wallets, debit cards, credit cards, or UPI, the payment status was immediately verified online, speeding up billing significantly.

This real-time tracking eliminated payment delays, reduced checkout times, and ensured accurate financial records across stores. Customers benefited greatly, experiencing shorter wait times, smoother checkouts, and a more convenient shopping environment. For Reliance Retail, the system provided accurate, real-time insights into sales and inventory, simplifying financial management and stock replenishment.

As a direct result of this integration, Reliance Retail observed a marked increase in customer satisfaction, leading to increased store loyalty and repeat purchases. Thus, leveraging internet-based technology within their POS infrastructure enabled Reliance Retail to greatly enhance operational efficiency and elevate customer experiences across its massive retail footprint.

5. Data Analytics and Business Intelligence

With the internet, businesses gather and analyse user data, sales trends, customer behaviour, and website traffic to make evidence-based decisions.

Tools: Google Analytics, Microsoft Power BI, Tableau, CRM analytics.

Use Case: An online bookstore uses Google Analytics to understand which genres are most searched and buys more inventory accordingly.

Case Study: How Flipkart Uses Data Analytics for Personalised Customer Experiences

Flipkart, one of India's largest e-commerce companies, relies heavily on data analytics to deliver personalised experiences to its customers. By carefully analysing customer data such as browsing history, search queries, purchase patterns, and wishlist items, Flipkart customises the shopping experience uniquely for each user.

For instance, Flipkart's homepage appears differently for every customer based on their previous interactions. A customer who frequently searches for electronic gadgets will see personalised recommendations featuring the latest electronics, while someone interested in fashion products might see relevant apparel suggestions upfront.

Additionally, Flipkart strategically offers special discounts or limited-time offers on items that customers have added to their wishlists but not yet purchased. These targeted incentives encourage users to complete their transactions, significantly increasing conversion rates.

Flipkart also uses customer data to send timely and relevant push notifications, such as price-drop alerts on previously browsed products or reminders about ongoing sales. These personalised notifications grab customers' attention and prompt immediate engagement, often resulting in higher sales and customer satisfaction.

Overall, Flipkart's effective use of customer data analytics has led to improved customer engagement, loyalty, and conversion rates, ultimately enhancing the company's market position and profitability in India's competitive e-commerce landscape.

6. Customer Relationship Management (CRM)

Internet-based CRM systems help businesses manage, track, and nurture customer relationships. They store information like purchase history, preferences, and feedback to offer personalised services.

Tools: Zoho CRM, Salesforce, Freshdesk.

Use Case: A travel agency uses Zoho CRM to send birthday offers to past customers and track follow-ups for holiday packages.



Case Study: JioMart's Integration of WhatsApp for Seamless Customer Interaction

JioMart, the online grocery and retail arm of Reliance Industries, introduced an innovative approach to customer service by integrating WhatsApp - India's most widely used messaging app—into its business operations. This move was aimed at simplifying the shopping experience and making customer interactions more convenient and familiar.

Through WhatsApp, JioMart allows customers to place and track their orders, ask questions, and receive real-time updates directly within the messaging app. For instance, a customer can initiate a conversation with JioMart by sending a simple “Hi” to their WhatsApp number. The chatbot or customer service team then provides options for checking order status, browsing ongoing offers, resolving delivery queries, and even receiving digital invoices—all without needing to install a separate app or log in to a website.

This integration not only improves customer convenience but also reduces service time. Since most users in India are already comfortable with WhatsApp, JioMart's strategy removed barriers related to app usage, especially among less tech-savvy consumers in semi-urban and rural areas. Moreover, JioMart uses WhatsApp to send personalised promotions, restock alerts, and seasonal discount messages, boosting user engagement and repeat purchases.

By embedding its services into a popular messaging platform, JioMart successfully enhanced customer satisfaction, expanded its digital reach, and streamlined communication, all contributing to stronger brand loyalty and increased sales across diverse consumer segments.

7. Cloud Computing and Infrastructure Management

Imagine you run a business and need a large storage room. You can either build one at your office (traditional computing), or rent space in a secure storage facility you can access anytime (cloud computing). Cloud Computing is the delivery of computing services—like servers, storage, databases, networking, software, analytics, and more over the internet (“the cloud”) instead of through a local server or personal computer.

Cloud computing means accessing data and applications online, anytime, anywhere, without having to store them on your personal device. The cloud is a secure, flexible, scalable, and cost-effective facility.

Businesses now use cloud platforms to store data, host applications, and collaborate without relying on physical servers. This reduces infrastructure costs and increases scalability.

Tools: Google Cloud, AWS, Microsoft Azure, Dropbox.

Use Case: A startup uses Google Workspace to store files, share calendars, conduct virtual meetings, and manage emails—all in the cloud.

Case Study: Zerodha's Cloud-Based Kite Platform for Real-Time Trading

Zerodha, India's largest stock brokerage firm, has transformed the trading experience for millions of investors and traders through its flagship platform, Kite. A key factor behind Kite's performance and popularity is its cloud-based infrastructure, which supports seamless and scalable access to real-time financial data during stock market hours.

Instead of relying on traditional local servers, Zerodha hosts the Kite platform on cloud servers, enabling fast, reliable, and secure processing of massive volumes of data. This setup allows millions of users to place trades, track live market movements, and access charts and indicators without delay, even during peak trading hours when activity is at its highest.

The cloud infrastructure offers Zerodha multiple advantages: it ensures high availability, automatically scales resources based on demand, and maintains minimal latency in trade execution—a critical factor in stock trading where every second counts. In addition, the cloud-based model simplifies updates and maintenance, allowing Zerodha's tech team to implement new features, security patches, or system enhancements without causing downtime for users.

By leveraging the power of cloud computing, Zerodha has not only delivered a fast and smooth trading experience to its customers but has also maintained cost-efficiency and operational resilience. This approach has played a crucial role in Zerodha's continued growth and leadership in India's competitive financial services industry.

8. Globalisation and Remote Business

The internet has turned even small businesses into global players. With e-commerce, virtual meetings, and global payment gateways, geographical boundaries are no longer a limitation.

Use Case: A digital marketing agency in Kerala serves clients in Canada and the UAE using Zoom for consultations and PayPal for payments.

9. Cybersecurity and Data Protection

As businesses rely more on the internet, they also invest heavily in security protocols like firewalls, VPNs, encryption, and two-factor authentication to protect customer data and intellectual property.

Use Case: An EdTech firm encrypts all student information and uses HTTPS and VPNs for internal data access, ensuring regulatory compliance.

The internet is the backbone of the contemporary business world, supporting operations from local startups to global enterprises. Its role is not limited to communication or sales—it's about intelligent integration of technology into every part of the business lifecycle. In today's economy, a business without the internet is like a shop with its shutters down—invisible, outdated, and cut off from opportunity.



1.2.8 Wireless Communication Technology

Wireless Communication Technology refers to the transmission of data or voice without the use of physical cables or wires. It enables devices to connect and communicate over distances using radio waves, microwaves, infrared, or satellite signals.

Key Features

- ◇ No physical cables needed
- ◇ Flexible and portable connectivity
- ◇ Enables real-time data transmission
- ◇ Suitable for both short and long-range communication

Types of Wireless Technologies

Wireless technologies are methods of transmitting data without the use of physical cables or wires. These technologies are crucial in today's connected world, enabling mobile communication, remote access, and the Internet of Things (IoT).

1. Wi-Fi (Wireless Fidelity)

Wi-Fi allows devices like laptops, smartphones, and tablets to connect to the internet or each other through a wireless router. It is based on IEEE 802.11 standards and operates mostly in 2.4 GHz and 5 GHz frequency bands. It's ideal for indoor connectivity and supports high data speeds for activities like video streaming, video conferencing, and online learning. It Uses Local area networks (LANs)

Example: Home Wi-Fi, office internet, campus networks

Use Case: A college campus offers free Wi-Fi to students, enabling them to attend online classes and access digital libraries on their mobile devices and laptops.

2. Bluetooth

Bluetooth is a short-range wireless technology standard used for exchanging data over short distances, typically up to 10 metres. It consumes very little power, making it suitable for battery-operated devices. It uses radio waves in the 2.4 GHz range and supports point-to-point or multipoint communication. It uses Short-range communication between devices

Example: Wireless headphones, keyboards, smartwatches, file transfer

Use Case: A person connects their Bluetooth earbuds to their smartphone to listen to music while jogging, without any cables getting in the way.

3. Mobile Networks (3G, 4G, 5G)

These are generations of mobile communication technology.

- ◇ 3G enabled mobile internet and basic video calling.

- ◇ 4G brought high-speed mobile internet, supporting HD video streaming and fast downloads.
- ◇ 5G is the latest and fastest, with very low latency and high bandwidth, enabling advanced technologies like smart cities, autonomous vehicles, and AR/VR.
- ◇ Use: Cellular communication and internet access

Example: Internet on mobile phones, mobile hotspots

Use Case: A ride-hailing app like Uber works on 4G/5G networks to track the driver's live location and manage real-time bookings.

4. Infrared (IR) and NFC (Near Field Communication)

- ◇ Infrared uses light waves to transmit signals, typically in remote controls. It requires a direct line of sight between the transmitting and receiving devices.
- ◇ NFC is used for secure, contactless communication between two devices at very close range (usually under 4 cm). It's widely used in digital payments, smart cards, and ID verification.

It uses device-to-device communication over very short distances.

Example: TV remotes (IR), contactless payments (NFC-enabled cards or smartphones)

Use Case: When you tap your phone or smartwatch to a card machine to make a UPI or Google Pay payment, you're using NFC technology.

5. Satellite Communication

Satellites orbiting the Earth transmit signals back to ground receivers, enabling communication even in areas where cable or mobile towers can't reach. It's essential for global positioning systems (GPS), military communication, weather forecasting, and emergency services.

It uses long-distance communication, especially in remote areas

Example: GPS navigation, satellite TV, internet in rural or remote regions

Use Case: A fisherman in a deep-sea fishing boat uses a GPS tracker and satellite phone to navigate and communicate, even far from coastal mobile networks.

Use Cases in Business

- ◇ Wi-Fi in offices for internet access, cloud file sharing, and VoIP calls.
- ◇ Bluetooth devices like wireless printers and headsets for flexible workspaces.
- ◇ 5G in manufacturing and logistics for real-time sensor data and automation.
- ◇ NFC in retail stores for quick, contactless payments.

Case Study: Jio's Public Wi-Fi Initiative – Bridging the Digital Divide

Reliance Jio, a major player in India's telecom revolution, took a significant step toward digital inclusivity with its Jio Public Wi-Fi initiative. By installing Wi-Fi hotspots at railway stations and other public places, Jio aimed to provide free internet access to millions of Indians, particularly those in semi-urban and rural areas who had limited access to reliable mobile data or broadband services.

This initiative had a transformational impact on a wide range of users. Travellers waiting at railway stations could now access the internet to check real-time train schedules, book tickets online, or connect with loved ones. Small vendors and local shopkeepers operating in and around these public places began using digital payment apps like UPI, PhonePe, Google Pay, and Paytm—tools that require stable internet connections. This shift allowed them to move away from cash-only transactions and join India's growing digital economy.

Beyond convenience, Jio's public Wi-Fi helped bridge the urban-rural digital divide by bringing affordable, wireless internet to regions that previously lacked connectivity. Students could download study material, job seekers could search for employment opportunities, and first-time internet users were introduced to essential digital services—all from a free, accessible Wi-Fi network.

Overall, the Jio Public Wi-Fi initiative represents a powerful example of how wireless technology can be used to democratise access to information and services, making the internet a tool for empowerment and inclusion across India.

Advantages

- ◇ Enhances mobility and flexibility
- ◇ Reduces installation costs
- ◇ Easy to scale and expand
- ◇ Supports remote working and BYOD (Bring Your Own Device)

1.2.9 Cloud Computing

Cloud Computing is the delivery of computing services, including storage, servers, databases, networking, software, and analytics, over the internet ("the cloud"). It enables users to access resources on-demand, without owning physical infrastructure.

Types of Cloud Services

Cloud services are typically delivered in three major models. These models represent different levels of control, flexibility, and management, each suited to different business or personal needs.

1. IaaS – Infrastructure as a Service

You have got an empty shop for rent. You get the space, electricity, and water. But you must bring in your own furniture, design, and goods. IaaS lets users rent basic computing infrastructure like servers, storage, networking, and virtual machines from a cloud provider on a pay-as-you-go basis. Infrastructure as a Service is a cloud computing model that provides virtualized computing infrastructure like servers, storage, and networking over the internet.

Example Providers

- ◇ Amazon Web Services (AWS) – Elastic Compute Cloud (EC2)
- ◇ Microsoft Azure – Virtual Machines
- ◇ Google Cloud Platform (GCP) – Compute Engine

Use Case: A startup developing an e-commerce platform may use IaaS to host its website, databases, and customer information without buying physical servers.

Key Benefits

- ◇ Highly scalable
- ◇ Cost-effective (only pay for what you use)
- ◇ Suitable for IT administrators and system architects

2. PaaS – Platform as a Service

If IaaS is an empty shop, PaaS is like a furnished bakery where you bring your recipe (code) and ingredients (data), and the ovens, counters, and packaging systems are ready to use. PaaS offers a ready-made development environment with tools to build, test, and deploy software applications, without worrying about managing infrastructure like servers or storage.

Example Providers

- ◇ Google App Engine
- ◇ Heroku
- ◇ Microsoft Azure App Services

Use Case: A team of developers wants to quickly build and launch a mobile app. They use PaaS to access programming tools, libraries, and deployment servers—all from the cloud.

Key Benefits

- ◇ Faster development cycle
- ◇ No need to manage hardware or software updates



- ◇ Best suited for developers

3. SaaS – Software as a Service

This is like dining at a restaurant, you simply enjoy the meal without cooking, serving, or cleaning. SaaS provides fully functional software applications over the internet. Users simply log in via a browser or app without worrying about installation, updates, or infrastructure.

Example Services

- ◇ Gmail, Google Drive
- ◇ Microsoft 365 (Word, Excel online)
- ◇ Zoom, Dropbox, Salesforce

Use Case: An educational institution uses Microsoft Teams and Google Classroom for online learning. Students and teachers access these tools from any device, anytime.

Key Benefits

- ◇ No need for installation
- ◇ Accessible from anywhere
- ◇ Best suited for end-users (non-technical)

Table 1.2.3 Types of Cloud Services

Feature	IaaS	PaaS	SaaS
Target Users	IT Admins	Developers	End-users
Control Level	Highest	Medium	Lowest
You Manage	Apps, data, runtime, OS	Apps and data	Just use the app
Provider Manages	Networking, servers, storage	Infrastructure + runtime + OS	Everything
Examples	AWS EC2, Azure VMs	Google App Engine, Heroku	Gmail, Dropbox, Microsoft 365

Let's say you are building a new online bookstore:

- ◇ Use IaaS to host your website and manage databases.
- ◇ Use PaaS to build and test your shopping cart application.
- ◇ Use SaaS tools like Google Analytics and Mailchimp to market and manage customers.

Use Cases in Business

- ◇ Startups use SaaS tools like Zoho for email, accounting, and CRM.

- ◇ Educational institutions adopt Google Workspace for classes and assignments.
- ◇ IT companies run applications on AWS to avoid spending on physical servers.
- ◇ Retail brands use cloud ERP systems to manage inventory across stores.

Case Study: Zomato's Cloud-Based Scalability with AWS

Zomato, one of India's leading food delivery platforms, relies on Amazon Web Services (AWS) to power its entire digital infrastructure. Hosting the platform on the cloud has enabled Zomato to achieve a high level of scalability, reliability, and operational efficiency, especially critical in a fast-paced, demand-driven industry like online food delivery.

Using AWS, Zomato can seamlessly handle millions of users, particularly during peak hours such as lunch and dinner times, or on weekends and public holidays. During national festivals or special promotional campaigns—when food orders spike dramatically—Zomato's system automatically scales up to meet the growing demand without delays or service disruptions. This elasticity ensures a smooth and uninterrupted customer experience, regardless of how many users are online.

In addition to scalability, Zomato benefits from AWS's robust data backup and security systems. User data including order history, payment details, and location preferences is securely stored and regularly backed up. This ensures business continuity, even in the event of system errors or cyber threats, and builds trust among customers.

Zomato's cloud-first approach has not only made its platform faster and more responsive but also cost-effective, as it avoids the need for large investments in physical servers and data centres. By leveraging cloud computing, Zomato has strengthened its ability to innovate quickly, launch new features, and maintain a competitive edge in India's rapidly growing food delivery market.

Benefits of Cloud Computing

- ◇ Cost Efficiency – Pay only for what you use.
- ◇ Scalability – Scale resources up or down as per demand.
- ◇ Accessibility – Access files and applications from anywhere.
- ◇ Data Security – Automatic backups and security protocols.
- ◇ Collaboration – Real-time teamwork on shared files or systems.

Table 1.2.4 Comparison Between Wireless Communication and Cloud Computing

Feature	Wireless Communication	Cloud Computing
Purpose	Transmit data without wires	Provide computing services via the internet
Technology Examples	Wi-Fi, Bluetooth, 5G	AWS, Google Drive, Salesforce



Business Application	Office mobility, remote access	Hosting websites, storing business data
Key Benefit	Mobility and flexibility	Scalability and cost-effectiveness
User Dependency	Hardware-enabled (devices)	Internet-enabled (cloud platforms)

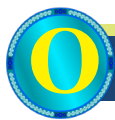
Both Wireless Communication Technology and Cloud Computing are essential pillars of the modern digital business ecosystem. While wireless technologies connect people and devices effortlessly, cloud computing hosts and delivers the services and data they rely on.

Together, they enable businesses to go digital, work remotely, scale rapidly, reduce costs, and improve customer satisfaction—cornerstones of contemporary success in a competitive market.



Recap

- ◇ The Internet is a global network that connects computers and devices, enabling information sharing, communication and business transactions across the world.
- ◇ The evolution of the Internet—from ARPANET to modern high-speed networks—has transformed how businesses operate and interact with customers.
- ◇ Internet protocols such as IP, TCP/IP, HTTP, HTTPS, SMTP and DNS allow devices to communicate reliably, securely and efficiently.
- ◇ Search engines help users locate information quickly, while web browsers act as interfaces that display websites and online content.
- ◇ Electronic mail (e-mail) remains one of the most widely used tools for formal business communication and information exchange.
- ◇ Wireless communication technologies like Wi-Fi and mobile data enable seamless connectivity, supporting remote access, online transactions and mobile operations.
- ◇ Internet technologies play a critical role in marketing, customer service, e-commerce, data storage and digital communication in modern businesses.



Objective Questions

1. What does the term 'Internet' refer to?
2. Which protocol ensures secure communication while browsing websites?
3. What does DNS stand for?
4. Name the protocol used for sending e-mails.
5. Which software application is used to access and view webpages?
6. What is the primary function of a search engine?
7. Which wireless technology enables devices to connect to the internet within a limited range?
8. What does TCP/IP help in?
9. Give one example of an internet-based business communication tool.
10. Which technology allows voice calls to be transmitted over the internet?



Answers

1. A global network connecting millions of computers and devices
2. HTTPS
3. Domain Name System
4. SMTP
5. Web browser
6. To locate and retrieve relevant information from the internet
7. Wi-Fi
8. Enabling communication and data exchange between devices on a network
9. E-mail / Web browser / WhatsApp Web / Google Meet (any one)
10. VoIP (Voice over Internet Protocol)





Assignments

1. Explain the evolution of the Internet and discuss how each stage contributed to the growth of modern business.
2. Describe any four major Internet protocols and illustrate their role in enabling online communication.
3. Compare search engines and web browsers, highlighting their functions and importance in business operations.
4. Prepare a short note on the role of e-mail in business communication and provide examples of how organisations use it effectively.
5. Identify the wireless communication technologies used in your home or neighbourhood and explain how they support daily online activities.
6. Visit a local business or online store and analyse how they use internet-based tools such as websites, search engines, social media or cloud services.
7. Create a simple diagram showing how a device connects to the internet through Wi-Fi or mobile data, labelling each step clearly.



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BLOCK - 03

Application of ICT in Business and Management

Unit - 1

Introduction to E-business and E-Commerce



Learning Outcomes

After completing this unit, the learners will be able to:

- ◇ explain the meaning and scope of e-business and e-commerce in the modern digital environment.
- ◇ identify the key components of an e-business system and describe how online platforms support business activities.
- ◇ outline the major steps involved in building and operating an e-business, from website creation to order fulfilment.
- ◇ distinguish between different e-commerce models and their relevance in business contexts.



Prerequisite

Arjun, a young entrepreneur from Kozhikode, had always dreamed of starting a business of his own. With a passion for handmade leather accessories, he opened a small workshop and began selling wallets and belts to nearby shops. Although customers appreciated his craftsmanship, sales remained limited. Footfall was unpredictable, marketing depended mostly on word-of-mouth, and expanding to other towns seemed expensive and uncertain.

One evening, a tourist purchased a wallet from Arjun's shop and asked if he had an online store. When Arjun replied that he only sold offline, the customer smiled and said, "You make great products, but the world can't find you unless you're online."

That night, Arjun began searching about how businesses sell through websites and social media. The more he explored, the more he realised that successful businesses no longer relied solely on physical outlets—they used e-business and



e-commerce platforms to reach wider markets, streamline operations, and serve customers efficiently.

Curious and determined, Arjun created a simple online page to showcase his products. Within days, he received enquiries from Bengaluru and Chennai. Encouraged, he upgraded to a full e-commerce platform with online payment options, customer reviews, and delivery tracking. Orders started flowing in steadily. His business, once bound to a small workshop, was now visible across India.

As Arjun expanded further, he noticed that technology supported every stage of his business: receiving orders through the website, procuring raw materials through digital vendor portals, managing inventory online, communicating with customers via automated messages, and collecting payments through secure gateways. He realised that e-business was not just about selling online—it was about integrating technology into every business process.

In this unit, you will explore how organisations like Arjun's adopt digital tools to transform traditional operations. You will learn the meaning and scope of e-business and e-commerce, the components that make online business possible, the steps involved in building an e-business, the different e-commerce models, and the basics of internet marketing. As you move through the unit, you will discover how businesses grow faster, reach farther, and operate smarter when technology becomes an integral part of their strategy.



Keywords

E-Business, E-Commerce, Online Transactions, E-Commerce Models, Digital Platforms, Internet Marketing, Website Interface, Online Customer Interaction



Discussion

As the global economy becomes more digitalized, companies are using technology to reach a wider audience, improve consumer experiences, and streamline operations. E-business practices are changing how organisations function, from cashless payments to online buying. Gaining success in the cutthroat, digital-first corporate environment requires an understanding of these ideas.

The rapid growth of the internet and technology has made it possible for businesses to adopt e-business and go beyond traditional ways. The foundation of modern commerce is e-business, which includes everything from setting up a website to using Internet tools for marketing and payment processing. Let us take a closer look at the key concepts.

3.1.1 E-Business

Many people now use the terms “e-business” and “e-commerce” interchangeably. However, they are not the same. They frequently use the word “e,” which stands for “electronic.” Electronic business refers to conducting business via the internet, intranet, online, and extranet. The marketing, purchasing, and selling of goods and services via the Internet is known as electronic commerce, or e-commerce. It encompasses all aspects of selling goods and services online. E-business, on the other hand, is essentially the buying and selling of products and services as well as other commercial endeavours conducted online. It also describes the procedures and equipment that enable businesses to employ Internet-based infrastructure and technology both inside and outside of their own walls to carry out routine business operations.

E-business is the practice of doing commercial operations, such as purchasing and selling, customer support, and partner collaboration, online. It includes every type of Internet business activity.

IBM defines e-business as “the transformation of key business processes through the use of internet technologies.”

For example, Amazon is a digital marketplace that enables customers to purchase diverse products, from books and electronic items to fashion and fresh foods. Besides purchasing products on its website or mobile app, Amazon also offers cloud computing services in Amazon Web Services (AWS), video streaming in Prime Video, and artificially intelligent helpers such as Alexa. Amazon’s business model encompasses B2C (directly selling to customers), B2B (Amazon Business for companies), and C2C (third parties offering products on its platform).

3.1.1.1 Components of E-Business

E-business functions similarly to the digital engine that drives modern companies. It helps businesses run more effectively, provide better customer service, and maintain their competitiveness by fusing technology and creative thinking. Consider a well-oiled engine in which sales, customer service, operations, and logistics all function together harmoniously. The machinery depends on essential elements that make up e-business. Every element is an essential part of a puzzle that fits together to give businesses and consumers a flawless business experience. These elements work together to deliver goods and services from the online marketplace to your door in a simple and pleasurable manner. Let us explore it in detail.

a. E-Commerce

Consider the situations where you buy a phone on Amazon, research models, pay, and have it delivered, or when you book a cab on Uber, where you use a mobile application to schedule and pay for the journey rather than calling a cab on the street. This is exactly what we call E-commerce.

E-Commerce means buying and selling products or services over the Internet. You shop, pay, and occasionally even have your products delivered using websites or mobile applications rather than going to a physical shop.



A good example of e-commerce is eBay. eBay is an internet-based marketplace where consumers and businesses can buy and sell goods of all sorts, such as electronics, clothing, collectables, and more. eBay mainly has a consumer-to-consumer (C2C) and business-to-consumer (B2C) format, with people able to list items for sale or auction by fixed price. It has safe payment and shipment online, thus making it one of the sites where global commerce is on high demand.

b. Customer Relationship Management (CRM)

Consider dining at a restaurant where the waiter recalls your favourite dish, is aware of your coffee preferences, and follows up to ensure everything is just right. CRM is the digital equivalent of this experience, making sure that each communication is smooth and tailored to the individual.

In E-business, customer relationship management, or CRM, refers to the use of digital technologies and tactics to establish, preserve, and improve connections with customers. To foster long-term loyalty and returning customers, the objective is to better understand consumer demands, deliver individualized experiences, and guarantee client pleasure.

Given that most consumer interactions with enterprises take place online, CRM is essential in the environment of e-business. Businesses employ technology to handle and improve these relationships in the absence of in-person interactions.

One such example of Customer Relationship Management (CRM) is Salesforce. Salesforce is a cloud-based CRM tool that enables organisations to manage customer interactions, sales, marketing, and customer support in one location. Salesforce is used by organisations to monitor leads, automate tasks, and customize customer communication to improve customer satisfaction as a whole. Its analytical features and AI-driven insights enable businesses to make informed decisions to further enhance customer relationships.

c. Enterprise Resource Planning (ERP)

Imagine an eatery at rush hour without a system: customers leave frustrated, orders are confused, ingredients run out suddenly, and payments take too long. There is chaos everywhere!

ERP can help with this; it is similar to employing a manager in a restaurant who makes use of an organized system to make sure everything goes without a hitch. It can ensure smoothness in functioning as follows,

- ◇ Using real-time orders, the manager makes sure the kitchen understands what to prepare.
- ◇ When supplies run low, they automatically place more orders based on the ingredient levels they monitor in the storage area.
- ◇ The cashier receives unambiguous updates about who paid for what.
- ◇ They make sure servers are aware of which table placed which order.

ERP is the effective manager in the world of e-business, coordinating all departments (cook, storage, cashier, and waiters) to ensure that the restaurant (company) provides its clients with exceptional service without any errors or delays.

In addition, ERP makes sure that e-business activities run smoothly by integrating departments such as finance, sales, inventory, and logistics into a single system, which speeds up, simplifies, and improves the reliability of the entire process.

A good example of Enterprise Resource Planning (ERP) is SAP ERP. It is a complete software solution that brings together different business functions, including finance, supply chain management, human resources, and procurement, in a unified system. Companies utilize SAP ERP to automate operations, enhance efficiency, and make data-driven decisions. Large companies, such as manufacturers and retail chains, utilize SAP ERP to effectively manage their intricate business functions.

d. Supply Chain Management (SCM)

Suppose you have a pizza delivery framework where the supplier supplies the restaurant with flour, cheese, and vegetables, the restaurant manufactures the pizza, stores it in the oven for a short time (warehousing), distributes it to the customer's door (distribution), and the customer eats it (final delivery).

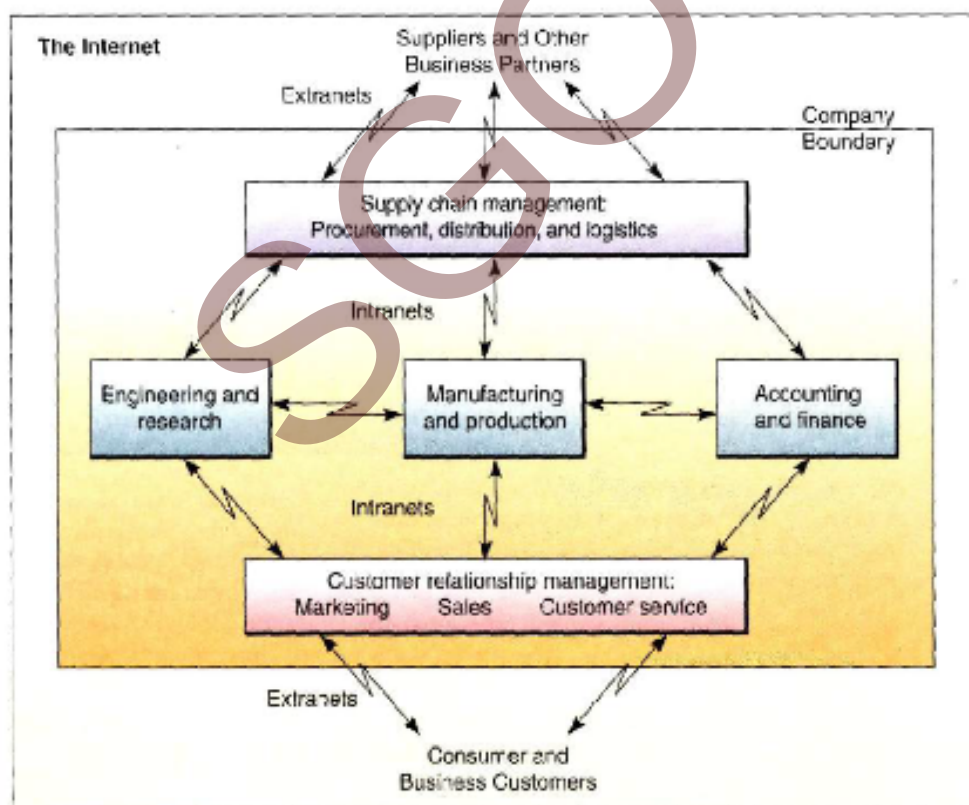


Fig. 3.1.1 E-Business Framework

All of these steps are managed digitally in e-business. Online orders are placed automatically, and you receive notifications like “Your pizza is on the way!” as the kitchen is alerted to prepare the pie and the delivery agent receives the route through an app.

This guarantees accuracy, speed, and efficiency all essential components of supply chain management in e-business.

Managing the movement of products, services, data, and funds from the producer to the consumer is known as supply chain management, or SCM. SCM is carried out electronically in the setting of e-business, utilizing digital tools and the internet to increase efficiency, save costs, and streamline procedures.

A prime example of Supply Chain Management (SCM) is that of Walmart’s supply chain model. Walmart exploits sophisticated SCM strategies, such as real-time observation, automated storages, and effective vendor collaborations, to preserve the continuity of product flow between vendors and shop floors. Its JIT-based inventory system minimizes storage costs along with maintaining well-stocked stores with popular merchandise. Walmart keeps its supply chain highly efficient and cost-saving in nature by adapting technologies such as RFID, big data analytics, and artificial intelligence.

3.1.1.2 Steps in Building an E-Business

Establishing an online business requires a number of methodical procedures to guarantee a successful launch and ongoing operation. Here is a brief explanation.

a. Idea Generation and Business Plan

Think of this phase as creating a design for your house. Without a good plan, construction cannot start. Identify the product or service you will offer online. Examine the market, your rivals, and your unique selling proposition (USP). Example: You want to start an online bakery offering customized cakes

b. Register Your Business and Domain Name

This is similar to deciding on the name and location of your internet store. Select a distinctive domain name (website address) for your e-business and officially register your organisation.

c. Build Your Website or Platform

Consider the website as your online storefront, where clients may view, engage with, and buy your goods. So, create a user-friendly, intuitive website or application. Ensure that it contains; listings of goods or services, secure payment methods and a shopping

cart, customer service information and contact details, and mobile-friendly layout.

d. Set Up a Payment Gateway

This is like to setting up a cash register in your store, but in a safe, digital format. Incorporate safe payment methods that let clients use digital wallets, UPI, debit cards, or credit cards to make purchases. Use payment processors such as PayPal, Stripe, or Razorpay, for instance.

e. Organize Logistics and Supply Chain

Logistics are similar to the trucks that transport goods from your store to the residences of your clients. Establish a procedure for managing inventories, processing returns, and delivering products. Select logistics partners such as delivery applications or courier services. For instance, to send cakes promptly and in ideal condition, collaborate with FedEx or nearby delivery providers.

f. Digital Marketing and Promotion

Digital Marketing is similar to employing flyers, banners, and word-of-mouth, except it takes place online. As an instance, an online bakery might advertise for special events like birthdays or anniversaries, post lovely pictures of their cakes on Instagram, and give discounts. Digital marketing includes email marketing to reach clients directly, search engine optimization (SEO) for your website, social media platforms (Facebook, Instagram), and sponsored advertisements (Google Ads, Facebook Ads).

g. Launch and Monitor Performance

Consider this phase as assessing the health of your store by looking at the number of customers, their purchases, and their preferences. Start your online business, use tools like Google Analytics or social media insights, and monitor performance indicators like website traffic, customer reviews, sales, and profit trends.

h. Customer Support and Improvement

It is similar to cultivating enduring relationships with clients to encourage repeat business. To keep customers and promote repeat business, deliver exceptional customer service. Update your systems and website frequently in response to consumer input. Businesses may promptly answer consumer questions, address grievances, and provide discounts to devoted clients.

3.1.2 E-Commerce

E-commerce is similar to a huge online mall, where you can shop at any business with just a click and have your products delivered right to your home.

The term “electronic commerce,” or “e-commerce,” encompasses a wide variety of online business operations involving goods and services. Additionally, it applies to “any type of business activity in which the parties connect electronically instead of through direct physical contact or physical exchanges.” E-commerce is commonly defined as



any activity involves the exchange of ownership or the right to use products or services via a computer-mediated network, including buying and selling via the Internet. Despite being widely accepted, this definition falls short in addressing current advancements in this brand-new, ground-breaking corporate phenomenon.

Myntra is a classic case of e-commerce. It is the online fashion and lifestyle retailer for India that offers clothes, shoes, accessories, and beauty products of various brands. Myntra follows a B2C business model and makes the experience of buying by providing end-of-season sales and individualized recommendations to customers. It is most famously known to have exclusive brand associations and Indian cyberspace for fashion.

3.1.2.1 E-Commerce Models

Shopping on the internet can be conducted in a variety of ways. We can categorize e-commerce into many business models based on the type of business and the way it is conducted. In the online marketplace, every e-commerce model has a distinct function. E-commerce effectively connects everyone in the digital world, whether you are a firm purchasing raw materials, a freelancer selling talents, or a consumer looking for goods

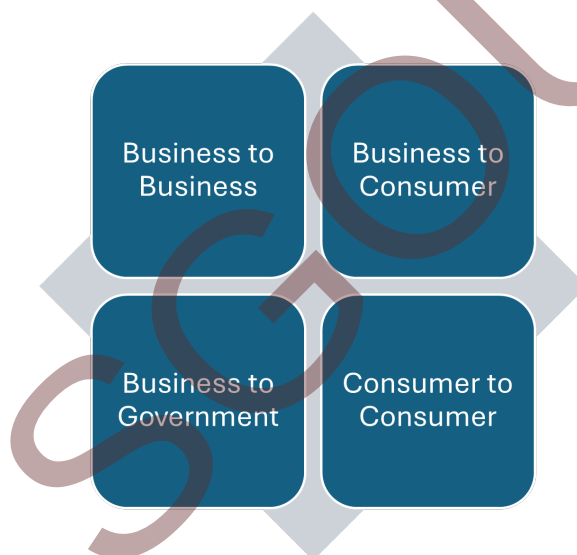


Fig. 3.1.2 E-Commerce Models

E-commerce models explain the interactions between companies and consumers in an online economy. Let us thoroughly explore them:

a. B2B (Business-to-Business)

B2B is like a factory providing a bakery with raw materials. E-commerce between businesses is known as business-to-business (B2B) e-commerce. This kind of e-commerce focuses on the connections between and among companies. This sort of e-commerce accounts for around 80% of all e-commerce, and according to most experts, B2B e-commerce will continue to develop at a higher rate than B2C e-commerce.

E-markets and E-Infrastructure are the two main parts of the B2B market. The B2B architecture is known as E-Infrastructure, and it mostly consists of the following:

- ◇ Logistics - transportation, warehousing and distribution (e.g., Procter and Gamble);
- ◇ Application service providers - deployment, hosting and management of packaged software from a central facility (e.g., Oracle);
- ◇ Outsourcing of functions in the process of e-commerce, such as Web- hosting, security and customer care solutions (e.g., outsourcing providers such as eShare);
- ◇ Auction solutions software for the operation and maintenance of real- time auctions in the Internet (e.g., OpenSite Technologies);
- ◇ Content management software for the facilitation of Web site content management and delivery (e.g., ProcureNet); and
- ◇ Web-based commerce enablers (e.g., Commerce One, a browser-based, XML enabled purchasing automation software).

The most basic definition of an e-market is a website where both buyers and sellers communicate and conduct commercial transactions.

Hewlett Packard (HP), Dell, Cisco, and IBM are the more well-known B2B examples and best practice models. For instance, more than 90% of product orders for Cisco are placed online.

b. B2C (Business-to-Consumer)

Customers who engage in business-to-consumer exchanges, collect information, buy tangible goods (like books or consumer goods) or information goods (like digital content, software or e-books); and, in the case of information goods, receive products via an electronic network.

It is the oldest and second-biggest type of online shopping. Online commerce, often known as e-tailing, is where it all began. Online retailers like Amazon.com are therefore the more prevalent B2C business models. Futurebazaar.com (from Big Bazaar), thehindushopping.com, indiaverta.com, fabmart.com, and others are a few Indian B2C e-commerce companies. Examples of business-to-consumer transactions incorporating information items include Expedia and Travelocity.

Applications of this kind of e-commerce are more prevalent in the fields of information and product purchase as well as personal finance management, which deals with managing one's own money and investments using online banking platforms like Quicken. By giving customers more access to information and enabling them to find the best deal on a good or service, business-to-consumer e-commerce lowers transaction costs, especially search costs.

Because setting up and maintaining a website is far less expensive than establishing a “brick-and-mortar” structure for a business, B2C e-commerce also lowers barriers to market entry. B2C e-commerce is even more alluring when it comes to information



goods since it spares businesses from having to account for the extra expense of a physical distribution network. Furthermore, it becomes more practical to distribute information commodities in countries with a large and growing Internet population.

An example of a Business-to-Consumer (B2C) model is one of the old-school ones is Zappos, which is an online apparel and shoe store. Zappos functions by selling shoes, clothes, and accessories directly to customers online with perks such as free return and great customer support. The model enables customers to shop and buy products from firms without intermediaries.

c. C2C (Consumer-to-Consumer)

C2C simply refers to business dealings between consumers or private individuals. The rise of online markets and auctions, especially in vertical industries where companies can bid for what they want from a variety of providers, is what defines this kind of e-commerce. It might be the most promising for expanding into new markets.

There are at least three varieties of this kind of e-commerce;

- ◇ Peer-to-peer systems, like the Napster model (a protocol for file sharing between users used by chat forums similar to Internet Relay Chat) and other file exchange and later money exchange models;
- ◇ Classified ads at portal sites like Sulekha.com and justdial.com classifieds; and
- ◇ Auctions conducted at a portal, like eBay, which permits online real-time bidding on items being sold on the Web.

One such instance of the Consumer-to-Consumer (C2C) e-commerce model is OLX. OLX is an internet-based marketplace where people can sell and purchase second-hand items like furniture, electronics, vehicles, and household items to other consumers directly. The users can list items for sale, negotiate with potential buyers, and transfer payments without any company involvement. OLX is a peer-to-peer trading platform, thus a sweetheart of used goods.

d. B2G (Business-to-Government)

Consider the Business to Government (B2G) structure as the construction business building a government public library. Following stringent government regulations, the company competes against other businesses in an electronic tender, gets the contract, and completes the project.

Businesses that use digital platforms to supply government agencies with goods, services, or information are referred to as operating under the Business-to-Government (B2G) model. Businesses use online portals or tender systems to offer IT solutions, offer specialized products, or bid on government contracts.

Important B2G E-Commerce Features:

- ◇ Digital Tendering: Companies use internet portals to place bids for government contracts.

- ◇ **Transparent Procedures:** Fair and open vendor selection is guaranteed by digital platforms.
- ◇ **Tailored Solutions:** Companies provide specific goods or services that are suited to the requirements of the government.
- ◇ **Rules Compliance:** Strict guidelines and compliance requirements are followed during transactions.
- ◇ **Large-Scale Contracts:** Long-term service agreements or bulk purchases are typically the subject of deals.

By bridging the gap between companies and government organisations, the business-to-government (B2G) framework facilitates transparent procedures, simplified service delivery, and effective procurement. It is essential to economic growth and the digital transformation of the public sector.

A prime example of the Business-to-Government (B2G) e-commerce paradigm is IBM. IBM offers information technology solutions, cloud computing, cybersecurity, and data analytics as services to specific government agencies globally. For example, IBM collaborated with governments to build smart city solutions, enhance data security for the public sector, and create digital infrastructure. This paradigm entails companies offering goods and services to government bodies through tenders, contracts, or direct collaborations.

3.1.2.2 Components of a Typical Successful E-Commerce Transaction Loop

A number of enabling and technological requirements must be met for e-commerce to be a viable substitute for traditional transactions and to optimize its advantages.

For an e-commerce ecosystem to be successful, each element is essential, and any weak link could hinder expansion.

- ◇ **Corporate Website with E-Commerce Capabilities:** A secure platform for online transactions, enabling smooth buying and selling experiences.
- ◇ **Efficient Intranet System:** Streamlined internal processes for managing and fulfilling orders effectively.
- ◇ **IT-Literate Employees:** Skilled staff to handle system operations, manage data, and ensure seamless workflow.
- ◇ **Banking Institutions:** Reliable payment gateways and transaction processing for secure credit card payments and electronic fund transfers.
- ◇ **Freight and Logistics Services:** Cost-effective shipping solutions for national and international delivery of goods.
- ◇ **Authentication Authority:** Trusted third-party services to verify transactions and maintain security.

- ◇ **Internet-Ready Consumers:** A critical mass of customers with internet access, disposable income, and a willingness to shop online.
- ◇ **Digitally Enabled Businesses:** Companies with online order management systems and integrated supply chains for seamless B2B transactions.
- ◇ **Government Legal Framework:** Clear regulations governing electronic transactions, digital signatures, and fraud prevention.
- ◇ **Law Enforcement Mechanisms:** Institutions to ensure compliance with laws and protect stakeholders from online fraud.
- ◇ **Robust Internet Infrastructure:** Reliable, high-speed connectivity to support online operations.
- ◇ **Affordable Internet Pricing:** Cost-effective internet plans that encourage prolonged and frequent online activity.

3.1.3 Internet Marketing

Businesses now have access to a wealth of marketing opportunities because of the Internet. Through the use of various digital platforms, companies can do more than simply advertise their goods and services online; they can attract new customers and convert them to increase sales. It is astounding how quickly and easily digital media can support a business and transfer data.

Consider Internet marketing as the establishment of a dynamic online shopping center. Each channel (websites, email, and social media) draws clients with special deals and eye-catching displays, much like a different store.

The practice of advertising goods, services, or brands online and through digital platforms is referred to as internet marketing, online marketing, or digital marketing. It uses a range of tactics and resources intended to draw in, hold the interest of, and turn online audiences into paying consumers.

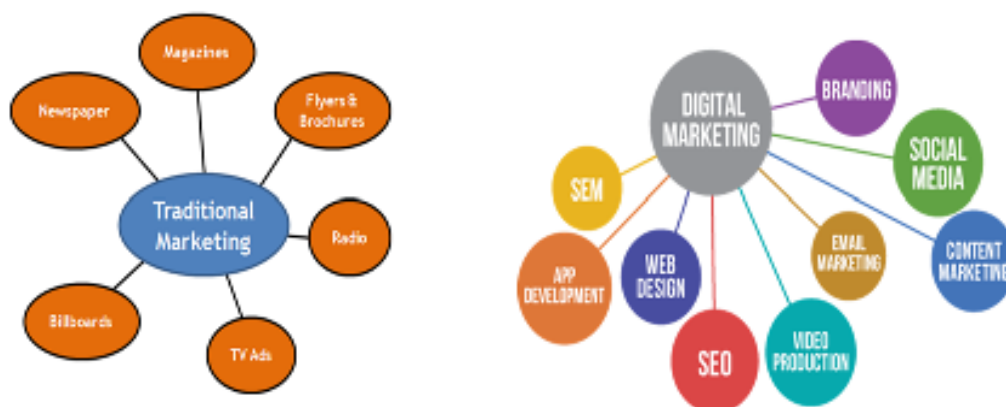


Fig. 3.1.3 Traditional marketing Vs Internet Marketing

A well-targeted, conversion-focused, measurable, and interactive marketing strategy that uses digital innovation to reach consumers and turn them into clients in a sustainable way is known as digital marketing. Digital marketing differs greatly from traditional marketing in that its entire concept and features are more capable, efficient, goal-oriented, and measurable.

A good example of Internet Marketing is Coca-Cola's online campaigns. Coca-Cola employs social media sites such as Instagram, Facebook, and YouTube to execute targeted advertisements, influencer partnerships, and interactive campaigns. Its most successful online marketing campaign was the "Share a Coke" campaign, where customized bottle labels promoted social sharing and user-generated content. Through online advertising, email marketing, and SEO, Coca-Cola successfully engages its audience and creates brand awareness worldwide.

3.1.3.1 Types of Internet Marketing

Businesses can use internet platforms to promote themselves in a variety of ways. While each of these forms of internet marketing has a distinct function, when combined, they form a potent plan for increasing brand recognition, drawing clients, and boosting sales online.

a. Search Engine Optimization (SEO)

SEO involves optimizing a website to improve its ranking in search engine results, making it more visible to users searching for relevant keywords. It includes on-page SEO (optimizing content, meta tags, and URLs), off-page SEO (building backlinks and social signals), and technical SEO (improving site speed, mobile-friendliness, and indexing). A well-optimized website attracts organic (free) traffic without relying on paid ads. For example, when you search for "best smartphones under Rs 500," a tech blog with strong SEO may appear at the top of Google results.

b. Search Engine Marketing (SEM) & Pay-Per-Click (PPC)

SEM involves running paid advertisements on search engines like Google Ads and Bing Ads to drive traffic to a website. PPC is a popular SEM model where advertisers pay a fee each time someone clicks their ad. These ads appear at the top of search results, marked as "Sponsored." For example, if a company selling running shoes bids on the keyword "best running shoes," their ad may show up when users search for that term, ensuring visibility and quick results.

c. Social Media Marketing (SMM)

SMM is the use of platforms like Facebook, Instagram, Twitter, LinkedIn, and TikTok to promote brands, engage audiences, and drive website traffic. Businesses post content, run paid ads, and interact with followers to build brand awareness and customer loyalty. For example, Nike uses Instagram to showcase new products, feature athlete endorsements, and engage users with interactive posts and stories.

d. Content Marketing



This strategy involves creating and distributing valuable, informative, and engaging content to attract and retain customers. It includes blogging, videos, infographics, case studies. The goal is to educate and build trust rather than directly sell. For example, HubSpot publishes detailed marketing guides and free tools to attract businesses looking for marketing solutions, ultimately converting them into customers.

e. Email Marketing

Email marketing involves sending promotional emails, newsletters, and personalized offers to customers to nurture leads and increase sales. Companies use automated emails to remind customers about abandoned carts, offer discounts, or share updates. For example, Amazon sends personalized emails recommending products based on a customer's browsing history and previous purchases, increasing the chances of repeat sales.

f. Affiliate Marketing

In affiliate marketing, businesses partner with individuals or websites (affiliates) who promote their products and earn a commission for every sale made through their referral links. This is common among bloggers, influencers, and review websites. For example, a tech blogger may write a review about a laptop and include an Amazon affiliate link—if someone buys the laptop using that link, the blogger earns a commission.

g. Influencer Marketing

This type of marketing involves collaborating with social media influencers who have a large and engaged following to promote a brand's product or service. Influencers create authentic content and recommend products to their audience, making it an effective form of digital word-of-mouth marketing. For example, beauty brands like Maybelline work with makeup influencers on YouTube and Instagram to showcase new products through tutorials and reviews.

h. Video Marketing

Video marketing involves creating and sharing engaging video content to attract customers. It includes YouTube videos, Instagram Reels, TikTok clips, and live streaming. Businesses use video marketing for product demos, testimonials, and storytelling. For example, GoPro's YouTube channel features extreme sports videos shot with their cameras, showcasing product quality while engaging adventure-loving audiences.

i. Mobile Marketing

Mobile marketing focuses on reaching users through SMS marketing, mobile apps, push notifications, and in-app advertisements. Businesses use mobile marketing to engage with customers in real time. For example, food delivery apps like Zomato and Uber Eats send push notifications with special discounts or reminders when users are likely to order food.

j. Display Advertising

Display ads include banner ads, pop-ups, and retargeting ads that appear on websites, apps, and social media platforms. Retargeting ads show products that users have previously viewed, encouraging them to complete a purchase. For example, if you

browse Nike's website for sneakers but don't buy, you may later see Nike's ads on other websites, reminding you to return and make a purchase.

3.1.4 Electronic Payment Systems (EPS)

Imagine picking up a goods from a retailer and using your phone to scan a QR code or tap your card instead of paying with cash. EPS essentially does the same function, but online. EPS refers to digital methods of making payments for goods and services online.

Electronic Payment Systems (EPS) have completely changed how we conduct financial transactions in the modern digital environment. With EPS, you may pay your electricity bill, purchase a product online, or subscribe to a streaming service quickly, securely, and conveniently without using cash or cheques.

EPS streamlines transactions and eliminates geographic restrictions by allowing individuals and businesses to exchange payments digitally across secure networks. Through digital wallets, mobile payments, or credit cards, EPS makes sure that your money transfers safely and effectively from your account to the seller's account.

An example of an Electronic Payment System (EPS) is PayPal. PayPal is an internet payment system which enables individuals to send and receive money securely on the internet. PayPal accommodates bank transfers, credit/debit card payments, and digital wallets, which are very convenient for e-commerce, freelancers, and businesses across the globe. It allows consumers to associate their bank cards or accounts with PayPal and make payments without having to provide sensitive financial information to merchants. It is used most frequently for online purchases, subscription services, and cross-border money transfers.

3.1.5 Types of EPS

There are several types of electronic payment systems (EPS), each designed to satisfy demands from customers and enterprises. Every kind of electronic payment system has a distinct function and meets the demands of various clients and companies. EPS has improved the speed, security, and convenience of financial transactions, from credit cards for simple internet purchases to cryptocurrencies for decentralized transactions.

By being aware of these possibilities, businesses and consumers can select the best solutions for their unique requirements, resulting in more seamless financial transactions in the digital age. The main EPS types are listed here, along with appropriate illustrations to help you understand them.

i. Internet Banking

Let us say you have a monthly electricity bill to pay. You use your mobile to easily make the payment by logging into your bank's Net Banking interface, entering the bill details, and avoiding the need to physically visit the electricity department. Internet banking is a digital service that allows customers to access and manage their bank accounts, conduct transactions, and use financial services online without visiting a



physical branch. The official website or app of a bank is used to conduct transactions directly. The main advantages are that it is safe, available around-the-clock, and eliminates the need to visit actual bank branches.

ii. Mobile Banking and Payments

Suppose you are at a farmer's market and the merchant takes payments through mobile applications like PhonePay or Gpay. The payment is made instantaneously from your phone when you launch the app and scan the QR code. Using smartphone applications or services to conduct transactions is known as mobile payments. These applications accept payments through direct transfers using mobile phones, NFC (Near Field Communication), or QR codes.

Quite like this, you can also have mobile applications developed by commercial banks for availing all your banking services. Mobile banking also has become popular in this tech savvy era.

iii. Debit and Credit Cards

Among the most often used electronic payment options are credit and debit cards. With a credit card, customers can borrow money from the bank to make purchases that they will have to pay back later, but with a debit card, they can spend money straight from their bank account. Both cards provide easy and safe methods to shop in-store or online.

Let us say you wish to purchase a new phone online. Your debit card information is entered at checkout, and the payment is processed in a matter of seconds. As an alternative, if you are short on cash, you might purchase the phone with your credit card and settle the balance later.

iv. Electronic Fund Transfer (EFT)

EFT refers to electronic transfer of money between bank accounts without the need for cash or paper cheques. RTGS (Real-Time Gross Settlement) and NEFT (National Electronic Funds Transfer) are two examples. NEFT is appropriate for smaller and less urgent transactions since it uses a batch processing method, in which payments are processed in batches at predetermined intervals. RTGS, on the other hand, is usually utilized for high-value transfers and handles each transaction separately in real-time, guaranteeing immediate settlement. While RTGS provides speed and immediacy, making it more appropriate for urgent or significant money transfers, NEFT is more affordable and perfect for daily transactions. When combined, these technologies offer dependable, safe, and effective means for people and companies to transfer money between bank accounts, making a substantial contribution to a cashless and technologically advanced economy.

For instance, you might wish to transfer funds to a friend who is studying overseas. You start an RTGS transfer after logging in to your bank's website and entering their bank information. In real time, the funds are transmitted safely.

v. E-Cash

E-cash is digital currency used for online payments. You purchase a ₹100 prepaid digital gift card. Your personal financial information is kept private when you use it to make purchases from an online retailer without connecting your credit card or bank account. This is how E-Cash works. The term “E-cash” describes electronic or digital currency that can be used for transactions conducted online. Usually, it is pre-paid and kept in a safe digital wallet or card. E-cash functions similarly to actual cash but is available online, providing security and anonymity.

vi. Digital Wallets

Digital wallets are online or mobile services that let users keep their credit card information and easily make purchases. These wallets offer a speedy checkout process and do away with the need to continually enter payment information.

3.1.6 Emerging Trends in E-Business

As technology advances, the e-business landscape is changing quickly, changing how companies engage with their customers, run their operations, and spur expansion. The following are some significant new developments that are changing the e-business scene.

a. AI and Chatbots

A chatbot appears when you go to an online clothes retailer and asks if you need help. Without human assistance, it checks the status of your order, suggests popular outfits, and assists you in finding the correct size.

Chatbots and artificial intelligence (AI) are transforming e-business sales and customer support. Chatbots may respond to consumer inquiries around-the-clock, fix problems right away, and even make product recommendations based on user preferences. AI examines consumer information to offer tailored suggestions and enhance the overall purchasing experience.

One of the excellent examples of Business Chatbots and AI is customer support on an e-commerce Shopify platform via ChatGPT. Most online retail businesses utilize chatbots based on AI to solve customer problems on product information, order status, and problem resolutions in real-time. The AI chatbots take advantage of NLP to determine customer requests and reply in split seconds and precise responses with zero or negligible manual intervention. For example, H&M’s chatbot on the website helps users decide outfits based on their preference, enhancing user experience and sales. AI chatbots make operations more efficient, reduce response time, and operate 24/7, hence of immense benefit to businesses.

b. Blockchain

Blockchain technology is perfect for e-business supply chain management, data sharing, and payments since it provides safe, transparent, and impenetrable transactions. By ensuring that each transaction is validated and documented in a decentralized ledger, it reduces errors and fraud.



For example, most luxury goods online retailers track a product from production to delivery using blockchain technology. Consumers can monitor the path of their purchases and confirm their validity by scanning a QR code on them.

c. Voice Commerce

Let us say you run out of coffee pods. Rather than inputting data into your phone, you say something like, “Alexa, order coffee pods from my favourite store.” Order placement and confirmation go smoothly.

Customers may use voice commands on smart devices like Google Home or Amazon Alexa to search for things, add them to a cart, and make purchases thanks to voice commerce. Because of its hands-free capability and ease of use, this trend is becoming more and more popular.

d. Augmented Reality (AR)

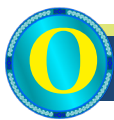
Sometimes you may find it difficult choose products for your home without knowing whether it would suit your home or how it will look. For instance, when you are purchasing a sofa online, but you are not sure if your living room will accommodate it. You can use your smartphone’s camera to place a virtual sofa in your room and see how it appears thanks to the store’s app’s augmented reality feature.

Customers may virtually engage with things before making a purchase thanks to AR, which blends digital and physical aspects. In sectors where consumers prefer to “try before they buy,” such as fashion, furniture, and cosmetics, this is especially helpful. Benefits of this feature include a decrease in product returns, an increase in client confidence, and improved online shopping.



Recap

- ◇ E-business refers to the use of digital technologies to support and integrate all major business activities, while e-commerce focuses mainly on buying and selling goods and services online.
- ◇ The growth of the internet and digital platforms has enabled businesses to reach wider markets, operate efficiently and improve customer engagement.
- ◇ Key components of e-business include online platforms, secure payment systems, digital communication tools and technology-enabled business processes.
- ◇ Building an e-business involves steps such as creating an online presence, listing products or services, enabling transactions, managing orders and ensuring customer support.
- ◇ E-commerce models differ based on the nature of transactions and include B2C, B2B, C2C and C2B formats.
- ◇ Internet marketing uses online tools and platforms to attract, engage and retain customers by applying digital communication strategies.



Objective Questions

1. What does the term e-business refer to?
2. Which concept specifically deals with buying and selling goods or services online?
3. Name any one component of an e-business system.
4. What does B2C stand for in e-commerce models?
5. Which digital tool is commonly used to promote products and attract online customers?
6. What is the primary purpose of an e-commerce website?
7. Give one example of an online payment method used in e-business.
8. Which model describes online transactions between two businesses?
9. What is internet marketing used for?
10. Name one platform used by small businesses to sell products online.



Answers

1. Use of digital technologies to support business operations and processes
2. E-commerce
3. Website / Online payment gateway / Digital communication tool / Inventory system (any one)
4. Business-to-Consumer
5. Social media marketing / Online advertising / SEO (any one)
6. To display products or services and enable online purchases
7. UPI / Credit card / Debit card / Net banking / Digital wallet (any one)
8. B2B (Business-to-Business)
9. To attract, engage and convert customers online
10. Amazon / Flipkart / Shopify / Instagram Shops / Etsy (any one)





Assignments

1. Explain the meaning of e-business and describe how it differs from traditional business practices.
2. Discuss the major components required to build a functional e-business platform with suitable examples.
3. Illustrate the steps involved in developing an e-business and explain why each step is important.
4. Compare different e-commerce models (B2B, B2C, C2C, C2B) and provide real-world examples for each.
5. Prepare a brief report on how a local business uses e-commerce or online tools to reach customers.
6. Create a simple flowchart showing the process of an online purchase from browsing to delivery.
7. Write a short note on the role of internet marketing in increasing customer engagement in e-commerce



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Unit - 2

Other Applications of ICT



Learning Outcomes

After completing this Unit, the learner will be able to:

- ◇ explain the major applications of ICT in business and management.
- ◇ describe the functioning and importance of office automation and virtual office systems.
- ◇ identify different types of electronic payment systems and understand their role in business transactions.
- ◇ explain the concept and benefits of Enterprise Resource Planning (ERP).
- ◇ understand the basic legal and ethical issues related to ICT use in the cyber world.



Prerequisite

As Arjun's online leather accessories business continued to grow, he began noticing that managing everything manually was becoming more difficult. Orders arrived from multiple platforms, customer enquiries increased, and coordination with suppliers became more frequent. Although moving to e-commerce had expanded his reach, it also brought new challenges—handling payments on time, keeping track of stock levels, managing delivery schedules, and staying updated with customer requests.

One afternoon, while reviewing his orders, Arjun caught himself juggling between different apps, notebooks, and phone calls. It became clear that running an online business required more than just a website. He needed tools that would help him organise information, simplify routine tasks, and keep different parts of his business connected smoothly. His friend, who managed a startup, casually remarked, “You don't have to do everything yourself—technology can do half of the work for you.”

This made Arjun realise that beyond selling online, businesses today rely on a range of digital tools and systems that support day-to-day operations, improve coordination, and allow teams to work efficiently from anywhere. These tools help businesses manage finances, communicate with customers, maintain records, schedule work, and keep everything running without unnecessary delays.

In this unit, you will explore some of these important applications of ICT—tools and systems that make business processes faster, more organised, and more reliable. As Arjun discovered, these technologies are not just add-ons; they form the backbone of how modern businesses operate behind the scenes.



Keywords

Office Automation, Virtual Office, Electronic Payment System (EPS), Internet Banking, Mobile Banking, ERP, Cyber Ethics, Cyber Law, Digital Transactions, ICT Applications



Discussion

The way modern workplaces operate has been completely transformed by the incorporation of Information and Communication Technology (ICT) into office administration. ICT technologies help firms function more effectively and efficiently by improving data management, automating repetitive operations, and enabling smooth communication. ICT has become a crucial part of administrative procedures, from word processing software and digital calendars to sophisticated collaborative platforms and cloud-based storage. By giving users instant access to vital information, its use not only saves time and minimizes errors but also enhances decision-making.

3.2.1 Office Automation

Consider your workplace a busy factory, where employees are always on the go, handling papers and attempting to stay updated with the steady stream of information. Imagine that many of those chores are managed by a group of productive robots and digital technologies. Office automation has that kind of power.

Office automation is similar to having an individual assistant who supports you with all tasks, including email management and document creation. It is an assortment of technologies designed to simplify, expedite, and improve the effectiveness of your work.

Office automation involves using computer systems and software to digitally create, collect, store, manipulate, and relay office information needed for accomplishing basic



tasks. It enhances the efficiency and productivity of office tasks by automating routine processes such as data entry, document management, communication, and scheduling. By reducing the need for manual intervention, office automation enables employees to focus on more strategic and high-value activities.

3.2.1.1 What makes workplace automation important?

- ◇ **Enhanced productivity:** You can concentrate on more crucial work by automating repetitive chores.
- ◇ **Better efficiency:** Automating your office can help you cut down on errors and simplify your routine.
- ◇ **Savings:** Using technology, you may cut costs on paper, printing, and numerous other office supplies.
- ◇ **Improved communication:** Using office automation solutions, you may interact with clients and coworkers more successfully.

3.2.1.2 Types of Office Automation Tools

Office automation technologies reduce human error and streamline procedures by using technology to automate routine tasks. Some of the several kinds of office tools for automation are listed below.

a. Workflow Management Systems

With the aid of this kind of office automation solution, you may send important reminders, set new deadlines, and keep important stakeholders updated.

A workflow automation system minimizes manual labour, mistakes, and delays by streamlining repetitive procedures with digital technologies. For instance, when an employee files a request for leave online, it is automatically forwarded to their management for consideration. With a single click, the manager can approve or reject it, and the system promptly updates HR records and alerts the employee. Everyone benefits from time savings, real-time tracking, and the elimination of paperwork. Workflow automation improves office operations' accuracy, efficiency, and transparency by automating repetitive procedures.

b. Process Automation System

You may increase productivity and efficiency by digitizing routine office tasks with the aid of process automation solutions.

End-to-end workflows are streamlined and optimized via process automation systems, which manage repetitive operations with little assistance from humans. For example, suppliers input invoices to an online portal for automated invoice processing, where software collects information, compares it to purchase orders, and schedules payments after approval. Additionally, the system alerts suppliers when a payment is completed. By lowering errors, saving time, guaranteeing consistency, and increasing efficiency, this method frees up staff members to concentrate on higher-value work.

c. Document Management System

These tools assist organisations in maintaining the organisation of all their documents. In order to save time and effort, it guarantees convenient accessibility.

A Document Management System (DMS) eliminates the need for physical storage and manual filing by automating the digital organisation, retrieval, and storage of documents. For instance, staff members can scan and submit reports, contracts, and invoices into a company's central digital repository. The documents are automatically tagged and categorized by the DMS, which facilitates easy searching by dates, keywords, and other characteristics. Secure real-time access, editing, and sharing of documents by authorized users enhances teamwork and lowers the possibility of missing or lost information. By keeping an orderly, immediately available digital record, this approach guarantees compliance, increases efficiency, and improves document security.

d. Task Management System

Task management systems make it easier for different team members to collaborate, measure progress, and arrange all of your tasks based on priority.

Within an organisation, a task management system simplifies task planning, tracking, and completion. Employees can utilize the system, for instance, to create, allocate, and prioritize tasks according to project needs and deadlines. In addition to tracking work in real time and sending reminders as deadlines draw near, the system automatically alerts team members of new assignments or changes. Managers are able to keep an eye on the progress of every assignment, distribute resources efficiently, and guarantee that everything is finished on time. By giving a clear picture of duties, lowering the possibility of tasks being missed, and improving teamwork, this method boosts productivity.

e. Data Analytics System

A vast quantity of complex data can be represented visually using data analytics tools, such as pie charts and bar graphs.

Large amounts of data are gathered, processed, and analyzed by a data analytics system to produce useful insights for decision-making. To discover purchase habits, forecast demand, and optimize stock levels, for instance, a retail company's system collects consumer data, sales trends, and inventory levels. The technology helps managers make data-driven decisions to increase sales, customer satisfaction, and operational efficiency by producing comprehensive reports and visual dashboards. Businesses can gain a competitive edge, optimize tactics, and identify hidden trends by utilizing real-time data.

In addition to this, any business can implement a variety of systems based on its requirements. Financial automation, electronic publishing, picture processing, and more are a few additional examples of office automation systems.

3.2.1.3 Office Automation Technologies

The term “office automation technologies” describes the range of electronic devices and programs that are used to optimise office workflows. Automation, improved communication, and higher output are all possible with these technologies.

Office automation solutions can boost productivity, facilitate collaboration and communication, and save businesses money and time. Additionally, they can help companies become more adaptable and change-responsive.

Some of the important categories of automation tools used by corporations are listed below;

a. Typing and Copying Machines

Typewriters

Consider typing a document in the absence of a computer. In the past, typewriters were the main instrument used to produce written material. These were mechanical apparatuses that struck ink onto paper with keys. For a long time, typewriters were necessary for office work, even though they are largely obsolete now.

Photocopiers

Do you recall the thrill of using a photocopier to make several copies of your coursework? Photocopiers transformed the reproduction of documents by enabling users to swiftly produce accurate duplicates of papers. With their ability to duplicate documents quickly and easily, photocopiers have long been a common sight in businesses. They are still a vital tool for many firms, even though their use has slightly decreased with the advent of digital document exchange.

Printers

Compared to earlier models, modern printers have greatly improved. These days, they have been coupled with computers to enable smooth document generation and output, and they can print in excellent resolution, frequently in colour.

b. Communication Devices

Telephone Systems

Both landlines and cell phones are now essential for both internal and external communication in offices. We use our phones for everything these days, from scheduling appointments to finalizing transactions.

Fax Machines

Fax machines used to be necessary for sending papers, but they are less frequent now because of email and scanning. In the past, fax machines were a common sight in offices since they made it possible to send papers quickly across phone lines.

Computers and Networks

Computers serve as a platform for a number of communication tools, such as video conferencing, instant messaging, and email.

Social media and the internet have further changed communication by enabling real-time connections with individuals all over the world.

Internet and Social Media

Social media platforms are used for networking and marketing, and the internet has completely changed communication by enabling worldwide connectedness. Consider attempting to manage a company without internet access. We use it for everything these days, from customer service to research.

c. Accounting Equipment

Calculators

Although they are less frequent now, they were historically necessary for calculations that required human labor. Do you recall those large calculators that were used in workplaces and classrooms? These days, computers and cellphones frequently come with built-in calculators.

Accounting software

Programs that automate computations, create financial reports, and expedite accounting procedures include Tally and QuickBooks. Accounting is now far more accurate and efficient thanks to these instruments.

Computers and Spreadsheet Software

For data management and financial analysis, computers and spreadsheet programs like Excel are essential. With spreadsheets, we may arrange, examine, and present data in ways that are not feasible with manual techniques.

3.2.2 Virtual Office

A virtual office is a service that allows businesses to operate remotely while still maintaining a physical presence. This innovative solution provides companies with a professional business address, mail handling services, and access to meeting rooms or office space when needed. Employees can work from various locations, leveraging digital communication tools like email, video conferencing, and cloud-based collaboration platforms to stay connected and productive. Virtual offices are particularly beneficial for startups, small businesses, and remote workers, as they offer a cost-effective alternative to traditional office spaces without compromising on professionalism.

The rise of virtual offices has been fueled by advances in technology and the increasing demand for flexible work arrangements. By utilizing a virtual office, businesses can reduce overhead costs, improve work-life balance for employees, and tap into a global talent pool. Additionally, virtual offices promote environmental sustainability by

reducing the need for daily commuting and physical office infrastructure. As the future of work continues to evolve, virtual offices are becoming an essential component of modern business strategies, enabling companies to adapt to changing market conditions and thrive in an increasingly digital world.

3.2.2.1 Features of a Virtual Office

A virtual office offers various services that help businesses function remotely while projecting a corporate image:

1. **Business Address:** Provides a prestigious mailing address for companies, often in prime locations, to enhance credibility.
2. **Mail Handling & Forwarding:** Receives and manages postal mail and packages, forwarding them to the business owner as needed.
3. **Phone Answering & Virtual Receptionist:** Offers professional call answering services, voicemail management, and call forwarding.
4. **Meeting Room Access:** Allows businesses to book conference rooms or coworking spaces as needed for client meetings.
5. **Live Chat & Customer Support:** Some virtual offices provide chatbot or human customer service support to manage client inquiries.
6. **Fax & Scanning Services:** Digital document handling solutions for businesses requiring fax or scanned document processing.

3.2.2.2 Benefits of Virtual Offices

Virtual offices offer several key benefits that make them an attractive option for modern businesses. Here are some of the most notable advantages:

1. **Cost Savings:** Virtual offices eliminate the need for physical office space, reducing overhead costs such as rent, utilities, and office maintenance. This allows businesses to allocate resources more efficiently and invest in other areas of growth.
2. **Flexibility:** Employees can work from anywhere, providing them with greater flexibility and work-life balance. This can lead to increased job satisfaction, productivity, and retention rates.
3. **Professional Image:** A virtual office provides a prestigious business address, mail handling services, and access to meeting rooms, which can enhance a company's professional image and credibility without the need for a physical office.

Additionally, virtual offices allow businesses to tap into a global talent pool, expand their market reach, and promote environmental sustainability by reducing the need for commuting and physical office infrastructure. These benefits make virtual offices a valuable asset for companies looking to adapt to the changing landscape of work.

3.2.2.3 Types of Virtual Offices

There are several types of virtual offices, each catering to different business needs and preferences. Here are some common types:

1. **Business Address Service:** This virtual office provides a professional business address for mail handling and receiving packages. It helps businesses establish a presence in a prestigious location without the need for a physical office.
2. **Virtual Receptionist Service:** A virtual receptionist can handle phone calls, take messages, and provide customer support. This service ensures that businesses maintain a professional image and can effectively manage customer inquiries.
3. **Mail Forwarding Service:** This service involves receiving mail at a virtual office address and forwarding it to the business owner's preferred location. It is particularly useful for businesses that operate remotely or internationally.
4. **On-Demand Meeting Rooms:** Some virtual office providers offer access to meeting rooms and office spaces on an as-needed basis. This allows businesses to hold meetings or work in a professional environment when required.
5. **Coworking Spaces:** Coworking spaces offer shared office environments where individuals from different companies can work together. These spaces often come with amenities like high-speed internet, printing services, and communal areas for networking and collaboration.
6. **Virtual Office Suite:** This comprehensive package combines various virtual office services, such as a business address, mail handling, phone answering, and access to meeting rooms, into one convenient offering. It provides businesses with all the essential tools to operate efficiently without a physical office.

By choosing the right type of virtual office, businesses can enjoy the benefits of a professional presence, cost savings, and increased flexibility.

3.2.2.4 Examples of companies that have successfully implemented virtual offices

- a. **Automattic:** The company behind WordPress.com and WooCommerce, Automattic has been a remote-first company since its inception in 2005. With over 1,200 employees working from all over the world, Automattic leverages a variety of tools and technologies like Slack, Zoom, and GitHub to maintain open communication and collaboration.
- b. **Buffer:** A social media management platform, Buffer has been a remote-first company since 2010. With a team of over 100 employees working globally, Buffer ensures success by maintaining open communication, using tools like Slack and Zoom, and providing access to company information, including finances, strategy, and goals.



- c. **Zapier:** A workflow automation platform, Zapier has been a remote-first company since its inception in 2011. With a team of over 300 employees spread across several continents, Zapier uses virtual offices to hire talent from around the world and maintain a flexible work environment.

These companies demonstrate how virtual offices can be effectively utilized to create a productive, flexible, and inclusive work environment.

3.2.3 Enterprise Resource Planning (ERP)

Consider your company to be a restaurant. The money, the supplies, the wait staff, and the kitchen are just a few of the many tasks you must oversee. ERP keeps everything operating smoothly and orderly, much like a digital kitchen hand. It's a software program that links every aspect of your business, including order processing and inventory control.

Businesses may manage and integrate all of their essential business activities with the use of enterprise resource planning (ERP) software. It functions as a sort of central hub that links every department inside a business, including supply chain management, human resources, accounting, and finance.

Example: SAP ERP at Coca-Cola

Coca-Cola, one of the world's leading beverage companies, implemented SAP ERP to streamline its operations and improve efficiency across its global supply chain. The company faced challenges in managing its vast network of suppliers, distributors, and retailers, which required a unified and integrated system to ensure smooth operations.

By adopting SAP ERP, Coca-Cola was able to:

- ◇ **Standardized Processes:** The ERP system standardized and automated various business processes, including procurement, production planning, inventory management, and financial reporting. This led to increased efficiency and reduced operational costs.
- ◇ **Improve Data Visibility:** The centralized ERP system provided real-time data visibility across the entire organisation, enabling better decision-making and faster response to market changes.
- ◇ **Enhance Collaboration:** The ERP system facilitated improved collaboration between different departments and business units, ensuring a more cohesive and coordinated approach to managing the supply chain.

As a result, Coca-Cola experienced significant improvements in operational efficiency, cost savings, and overall business performance. The successful implementation of SAP ERP allowed the company to maintain its competitive edge in the highly dynamic beverage industry.

This example demonstrates how ERP systems can help large enterprises streamline their operations, improve data management, and enhance collaboration to achieve better business outcomes.

3.2.3.1 Types of ERP Implementations

The needs of various firms are met by different ERP deployment models, and in order to choose the finest one for your company, it's critical to comprehend the distinctive features of each. ERP systems come in a variety of forms, including hybrid, multi-cloud, on-premise, and cloud-based options.

On- Premise ERP

When using an on-premises system, the company is in charge of security, upkeep, upgrades, and other adjustments and operates the software on its servers. In-house IT personnel with the necessary skills are typically needed for maintenance. On-premises ERP was the sole choice for a long time. However, this deployment model's usage has drastically decreased in recent years, and market researcher IDC anticipates further drops.

Cloud Based ERP

Remote servers under third-party management power cloud-based ERP. Users can access reports and data from any location with a connection to the internet by using a web browser, which gives them more freedom. Cloud ERP can be deployed in a variety of ways, such as hosted cloud or true cloud.

Hybrid ERP

Cloud and on-premises deployment components are combined in hybrid ERP. Two-tier ERP is one hybrid strategy in which a company uses cloud systems for subsidiaries or specific regional offices while maintaining its on-premises ERP at headquarters.

The on-premises system is then integrated with these cloud solutions. Different businesses might use their on-premises systems for different purposes and use cloud solutions for certain business needs. In any case, to guarantee a constant flow of information, the cloud systems must be connected to the on-premises platform. This is frequently easier said than done.

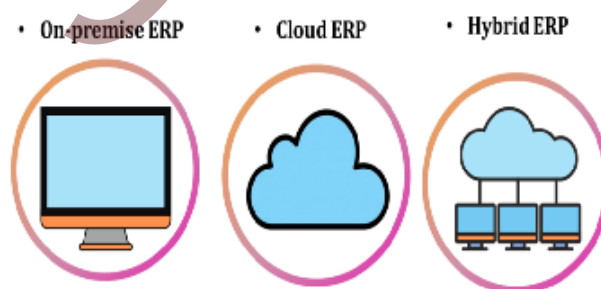


Fig.3.2.1 Types of ERP

ERP helps businesses in the following ways;

- ◇ **Streamline processes:** ERP systems can increase productivity and efficiency by automating procedures and minimizing manual labor.
- ◇ **Boost decision-making:** ERP gives organisations access to real-time data and insights, enabling them to make well-informed choices.
- ◇ **Boost collaboration:** ERP systems encourage improved communication and teamwork by dismantling departmental silos.
- ◇ **Cut costs:** By streamlining processes, getting rid of duplication, and allocating resources optimally, ERP can help companies cut costs.
- ◇ **Boost visibility:** ERP gives everyone a clear picture of the operation of the firm by serving as only one source of fact for company data.

Companies can effectively adopt ERP in different areas of business as follows;

a. E-Procurement

Assume you own a bakery and must purchase flour, sugar, and baking supplies on a monthly basis. Rather than calling vendors or going to various stores think about carrying out that activity the following way;

- ◇ **Go Online:** You access a business-oriented app or website.
- ◇ **Browse Suppliers:** A list of vendors who are selling the goods you require is displayed, along with their costs.
- ◇ **Compare & Purchase:** You look at prices, place an online order, and pay electronically.
- ◇ **Track Delivery:** Similar to tracking a package from an internet retailer, you receive updates on when your goods will arrive.
- ◇ **Records Saved:** Orders, payments, and supplier information are all automatically saved.

This is exactly e-procurement: utilizing digital tools and the internet to streamline, expedite, and organize your company's purchasing process!

The process of purchasing products and services for a company via online channels and digital devices is known as electronic procurement, or e-procurement. Businesses now manage everything from locating vendors to making orders and keeping track of deliveries using internet platforms rather than more conventional methods like documents, telephone discussions, or personal interactions.

For example: - General Electric (GE) implemented an e-procurement system to streamline its purchasing processes and improve efficiency. By automating procurement tasks, such as purchase order creation, approval workflows, and invoice processing, GE significantly reduced manual effort and minimized errors. The system also enhanced

supplier management, provided real-time visibility into procurement activities, and ensured better tracking of spending and compliance. As a result, GE experienced improvements in procurement efficiency, cost savings, and overall operational performance, optimizing its supply chain and maintaining a competitive edge.

b. E- Marketing

Suppose for the same bakery you wish to increase the number of people who purchase your products. You choose to advertise your bakery online rather than through local posters or word-of-mouth. Similar to traditional marketing methods, the objective here is to increase the visibility and image of the product in the minds of consumers and to pass on necessary information from time to time, which keeps the consumers engaged and connected with your business. You may have to do the following activities to achieve your objective;

You create social media profiles and a website for your bakery.

To reach individuals in your area, you make advertisements on social media and Google.

For instance, display an advertisement that reads, “Have a sweet tooth? Get 20% off your first order and enjoy freshly baked cupcakes when you visit Sweet Spot Bakery!”

When someone searches for “best bakery near me” or browses Instagram while organizing a party, the advertisements are displayed.

Example: When a local mother clicks on your advertisement, she learns that you also create personalized birthday cakes.

People may leave comments on your postings, inquiring about ordering or your menu. You communicate with them and react fast.

Example: “Do you make gluten-free muffins?” is a message someone sends you. and you respond, “Yes! Come test them out!”

To find out how many individuals clicked on your advertisement or went to your website, you need analytics software.

Example: You see an increase in cupcake sales after your campaign launches as more customers come in to take advantage of the 20% discount.

All these put together is called as E- Marketing. Utilizing digital tools and the internet to advertise your bakery, expand your clientele, and build your company while communicating with the people you serve online.

Using digital tools and the internet to promote goods and services is known as electronic marketing, or e-marketing. It is similar to traditional marketing, but it takes place online via emails, digital ads, social media, and websites.

There can be many ways by which you can market your products online. Let us look into some of the prominent ones.



- ◇ Search Engine Optimization (SEO): Enhances the content of websites to increase their organic search engine ranking.
- ◇ Pay Per Click Advertising: Uses search engine sponsored advertisements to generate rapid traffic.
- ◇ Content marketing: Produces informative content, such as blogs or videos, to draw in and hold on to clients.
- ◇ Social media marketing: Engages audiences by promoting businesses on Facebook and Instagram.
- ◇ Email marketing: Distributes tailored emails to advertise goods, provide news, or provide special offers.
- ◇ Affiliate marketing: Collaborates with affiliates to market goods in exchange for a cut of sales.
- ◇ Influencer marketing: Works with influencers to promote products by utilizing their audience.
- ◇ Mobile marketing: Uses mobile-optimized websites, mobile apps, or SMS to reach consumers.
- ◇ Video marketing: Uses YouTube or Instagram to interact with consumers through video content.



Fig. 3.2.2 Elements of E-Marketing

Depending on the nature of each and every business, according to the target group of consumers and the marketing objectives of the businesses, the decision of choosing one among the above-mentioned E-Marketing techniques becomes crucial for businesses.

c. E- Auction

Let us say your bakery has additional machinery that you no longer need, such as a commercial oven. You choose to use an e-auction site to receive the best price rather than selling it at a set price.

Now let us look how you can work this out.

Primarily you make a post on an e-auction website, revealing the oven's details, including pictures, condition, opening price, and bid guidelines. Then other bakers or local coffeehouse operators who are interested in purchasing the oven sign up on the marketplace and place a bid. Buyers may try to raise their bids as the auction date draws closer. The site alerts you and the buyer when the auction concludes and the highest bidder wins and you sell your oven to the winner for the bid price.

Simply put, an e-auction is a contemporary, digital method of buying or selling through competitive bidding. It has several advantages, including the ability to attract more bidders, the potential for price increases, and the time and effort savings that come with engaging remotely for both buyers and sellers.

An example of a successful e-auction is the procurement process used by the UK Ministry of Defence (MOD) for purchasing goods and services. The MOD implemented an e-auction platform to increase competition among suppliers and achieve better pricing. By conducting online auctions, the MOD was able to streamline the bidding process, increase transparency, and obtain significant cost savings. Suppliers could submit bids in real-time, fostering a competitive environment that led to more favourable contract terms for the MOD. The e-auction platform improved efficiency, reduced procurement costs, and enhanced the overall effectiveness of the MOD's purchasing process.

d. E- Retailing

Imagine now that you would like to sell homemade bread, cakes, and cookies both online and in your store. You can utilise an e-commerce platform such as Amazon, Etsy, or a personalised bakery app, or you can make your website. When customers need something from your online store, they can put it in their shopping cart. A secure payment gateway such as a digital wallet, PayPal, or credit card can be used by the client to make the purchase. Then, you package the product and schedule delivery to the customer's residence as soon as the money is paid. The customer helps other fellow consumers trust your bakery by posting feedback on your website after obtaining the cake.

E-retailing is similar to starting a 24-hour online bakery where clients can place orders for their preferred sweets from the convenience of their homes. It is up to date, effective, and broadens your clientele beyond your neighborhood store.

The process of selling goods directly to consumers online is known as electronic retailing, or e-retailing. It is similar to operating a store, only that clients shop online rather than in person.



Online platforms are used in electronic retailing, where companies sell goods and services to customers directly. It includes a number of essential elements. First, companies create online stores, usually via websites or mobile applications, where they list their goods along with thorough descriptions, photos, and costs. Consumers peruse these online catalogs, put the things they want in virtual shopping carts, and then check out.

Customers have a variety of payment alternatives at checkout, such as digital wallets, credit/debit cards, and other payment options via the internet. Encrypted transactions are used to process the payment securely. Following confirmation of the transaction, the company packages the goods and makes arrangements for shipment to deliver them. Businesses may offer customer service assistance at any point to respond to questions, handle returns, and guarantee client happiness. Here is a simple demonstration of the E-Retailing model for you to check out how it works.



Fig. 3.2.3 E-Retailing model

An example of successful e-retailing is Amazon, which has revolutionized the retail industry by providing an extensive online marketplace. By offering a wide range of products, competitive pricing, and convenient delivery options, Amazon has created an exceptional shopping experience for customers worldwide. The company's sophisticated logistics network, personalized recommendations, and user-friendly platform have enabled it to dominate the e-retailing sector, attracting millions of customers and generating significant revenue. Amazon's success demonstrates the potential of e-retailing to transform traditional retail practices and meet the evolving needs of consumers.

e. Electronic Supply Chain Management (E-SCM)

When operating a bakery, you might need to rely on a supply chain to obtain supplies like butter, sugar, and flour. You handle the entire process online using e-SCM. An

online system can be used to communicate with raw material suppliers. You can place orders to replenish your ingredients and keep an eye on their levels in real time with an e-SCM tool. To make sure you're prepared to accept it, you can get notifications about when the delivery van with the items will arrive. The technology can plan the production line for your bakery based on real-time supply updates. This is exactly how E-SCM can help you manage a business's supply chain needs.

Using technology and internet-based systems to manage the flow of products, information, and funds between manufacturers, distributors, retailers, and suppliers is known as electronic supply chain management or e-SCM. It improves supply chain visibility, efficiency, and coordination.

An example of successful electronic supply chain management (e-SCM) is Cisco Systems, a global leader in networking and technology. Cisco implemented an advanced e-SCM system to enhance visibility, collaboration, and efficiency across its supply chain. By leveraging digital tools and technologies, Cisco was able to streamline its procurement, production, and distribution processes. The e-SCM system provided real-time data on inventory levels, demand forecasts, and supplier performance, enabling Cisco to make informed decisions and respond quickly to market changes. As a result, Cisco achieved improved operational efficiency, reduced costs, and greater agility in meeting customer demands.

2.2.4 Legal and Ethical Issues in Cyber World

Businesses and individuals are depending more and more on digital platforms for communication, transactions, and data sharing in the quickly growing cyber world. But to preserve accountability, security, and confidence, several ethical and legal issues are raised by this digital revolution.

◇ Privacy Concerns

One of the main issues in the cyber world is making sure that client data is protected. Strong data protection procedures are becoming more and more necessary as companies gather enormous volumes of personal information, including names, addresses, and financial information. Misuse of personal information, data breaches, or unauthorized access can result in serious legal repercussions as well as a decline in trust. An e-commerce platform, for instance, needs to protect consumer payment information and guarantee the safe preservation of private information to stop hackers from taking advantage of it.

◇ Fraud

Cyber fraud, which includes identity theft, phishing, and online scams, is still a constant menace in the digital world. In order to obtain sensitive information, scammers frequently use phony websites, emails, or texts to pose as reliable organisations. To lessen vulnerabilities, businesses must use encryption technologies, secure payment channels, and customer authentication procedures. Preventing money losses and data breaches also requires educating users on how to spot bogus communications.



◇ Intellectual Property Rights

In the cyber world, where unlawful distribution, piracy, and illicit copying are prevalent, protecting digital content, software, and creative assets is a major concern. Laws pertaining to intellectual property protect authors and companies by prohibiting the unapproved use or duplication of their works. Digital Rights Management (DRM) solutions are another tool that businesses may use to manage who can access and distribute their intellectual property. DRM systems, for example, are used by streaming services like Netflix and Spotify to prevent unauthorized sharing of protected content.

◇ Compliance

Businesses that operate online must abide by data protection legislation including the General Data Protection Regulation (GDPR) and comparable local ordinances. These rules guarantee openness in the gathering, storing, and use of personal information. Heavy fines, legal ramifications, and harm to one's reputation might arise from noncompliance. To stay in compliance, organisations need to designate data protection officers, create explicit privacy policies, and conduct routine audits of their data management systems.

To preserve trust, security, and integrity in the digital age, it is important to handle legal and ethical issues such as privacy concerns, fraud prevention, intellectual property protection, and regulatory compliance. To maintain long-term viability and customer trust, businesses need to implement safe systems, encourage moral behaviour, and keep up with changing laws.



Recap

- ◇ ICT applications extend beyond communication and networking to support core business operations.
- ◇ Office automation systems help streamline administrative tasks, reduce paperwork and improve efficiency.
- ◇ Virtual office technologies enable employees to work remotely using digital tools and cloud platforms.
- ◇ Electronic payment systems such as internet banking, mobile banking and other digital modes support secure financial transactions.
- ◇ ERP integrates multiple business functions into a single system for better coordination and decision-making.
- ◇ Basic awareness of legal and ethical issues is essential to ensure responsible use of ICT in business.



Objective Questions

1. What does ERP stand for?
2. Name any one electronic payment system.
3. Which ICT application enables employees to work remotely?
4. What is the primary purpose of office automation?
5. Which banking service allows customers to perform transactions via mobile apps?
6. What does EPS refer to?
7. Give one example of a cyber ethical issue.
8. What does a virtual office rely on to function?
9. Name a tool used for digital administrative processing.
10. Which system integrates various business functions into one platform?



Answers

1. Enterprise Resource Planning
2. UPI / Internet Banking / Mobile Banking / Credit or Debit Card (any one)
3. Virtual office
4. To streamline and automate administrative tasks
5. Mobile banking
6. Electronic Payment System
7. Privacy breach / Unauthorized data access / Cyberbullying (any one)
8. Internet-based tools and cloud technologies
9. Document management system / E-form processing tool (any one)
10. ERP system





Assignments

1. Describe any three ICT applications that support daily business operations with suitable examples.
2. Prepare a short report explaining how office automation improves administrative efficiency.
3. Compare various electronic payment systems and discuss their advantages and limitations.
4. Explain the importance of ERP in modern organisations and provide examples of its use.
5. Identify basic ethical issues in ICT and discuss how organisations can promote responsible digital practices.
6. Conduct a brief survey of a local business and document the ICT tools they use for office administration and financial transactions.
7. Create a simple flowchart showing how a digital payment process works from initiation to confirmation.



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SGOU



BLOCK - 04

Emerging Trends in Information Technology

Unit - 1

Cloud Computing and Security Mechanisms



Learning Outcomes

After completing this unit, the learners will be able to:

- ◇ explain the concept, characteristics, and service models of cloud computing in business environments.
- ◇ differentiate between public, private, and hybrid cloud deployment models.
- ◇ comprehend major cloud security mechanisms such as encryption, firewalls, digital signatures, and identity management.
- ◇ evaluate the role of cloud computing in improving business efficiency, scalability, and data protection



Prerequisite

A small startup founder begins the day with nothing more than a laptop and an internet connection. He is storing business files online, conducting meetings through video calls, accepting digital payments, and signing agreements electronically without ever visiting an office. Even when working from different cities, the team collaborates smoothly because their data, software, and communication tools are securely available in the cloud. At the same time, invisible protective systems such as encryption, firewalls, and digital signatures quietly guard their information from cyber threats. This everyday digital experience reflects how modern businesses now depend on cloud technologies and strong security mechanisms to operate efficiently and safely.

This unit introduces the fundamental ideas of cloud computing and the essential security practices that protect digital information in today's technology-driven business world. Learners will explore cloud service models, deployment types,



real-world business uses, and the role of cryptography, firewalls, and digital signatures in safeguarding data and transactions. For BBA students, these concepts provide an important foundation for understanding how organisations manage technology resources securely, support remote operations, and build trust in the digital economy.



Keywords

Cloud Computing, Scalability, Encryption, Digital Signature, Firewall



Discussion

4.1.1 Cloud Computing

Think of a library, instead of buying your own bookshelves, books, lighting, and hiring librarians, you simply walk in, use the resources you need, and leave when you're done. Users are not required to manage maintenance, electricity, or storage requirements. The library handles all of that in the background. Cloud computing works the same way. Your computer, phone, or tablet connects through the internet to powerful remote servers (the "cloud"). These servers store data, run software, and perform heavy computations for you. You use the service when needed and pay only for what you consume, without owning or managing the physical infrastructure.

Cloud computing refers to the delivery of computing services—including servers, storage, databases, networking, and software—over the internet.. Instead of running applications or storing data on local computers or on-site servers, users access these resources remotely through cloud service providers. Modern business operations are no longer confined to physical offices, paper-based files, or local computing systems. Companies want flexibility, speed, scalability, and security. This need has given rise to Cloud Computing, one of the most important emerging trends in Information Technology.

Cloud computing is a model that enables convenient, on-demand network access to a shared pool of configurable computing resources, as defined by the National Institute of Standards and Technology (NIST).

Example:

Amazon Web Services (AWS) is one of the leading providers of cloud computing services. AWS offers a wide range of cloud services, including virtual servers (EC2), data storage (S3), databases, machine learning, and analytics. Major companies such

as Netflix, Airbnb, and NASA rely on AWS to scale their operations globally, handle massive amounts of data, and maintain high availability without managing physical data centers.

Other major cloud providers include Microsoft Azure and Google Cloud, which are widely used by enterprises, governments, and educational institutions.

Common examples of cloud computing usage include the following::

- ◇ Using Google Drive instead of a pen drive
- ◇ Using Gmail instead of installing email software
- ◇ Watching Netflix instead of storing movies on a hard disk

4.1.1.1 Characteristics of Cloud Computing

The major characteristics of cloud computing are explained below :

1. On-demand access

On-demand access means computing resources such as servers, storage, or software can be provisioned instantly whenever a user needs them, without waiting for approval or manual setup from the service provider. This allows organisations to respond quickly to changing requirements and reduce delays in operations or development work. For example, a startup can quickly deploy a virtual server on a cloud platform to test a new application without purchasing hardware.

2. Scalability

Scalability refers to the ability to increase or decrease computing resources based on workload demands. This flexibility ensures that systems perform efficiently during peak usage while avoiding wasted resources during low-demand periods. For instance, an e-commerce website can automatically scale up server capacity during a festive sale and scale it down once traffic returns to normal.

3. Cost efficiency

Cloud computing improves cost efficiency by eliminating the need for large upfront investments in physical infrastructure such as servers and data centers. Organisations follow a pay-as-you-use model, paying only for the resources they actually consume. For example, a small business can store data in the cloud and pay monthly storage fees instead of purchasing expensive in-house storage systems.

4. Accessibility

Accessibility in cloud computing means that services and data can be accessed from any location using an internet-connected device. This supports remote work, collaboration, and continuity of operations across geographical boundaries. For

example, students and faculty can access cloud-based learning platforms from home, campus, or while travelling.

5. Reliability and security

Cloud service providers ensure high reliability by using multiple redundant data centers, regular backups, and failover mechanisms. Advanced security measures such as encryption, identity management, and continuous monitoring protect data from unauthorised access and cyber threats. For example, even if one data center fails, cloud-hosted applications continue running seamlessly from another location, ensuring minimal disruption.

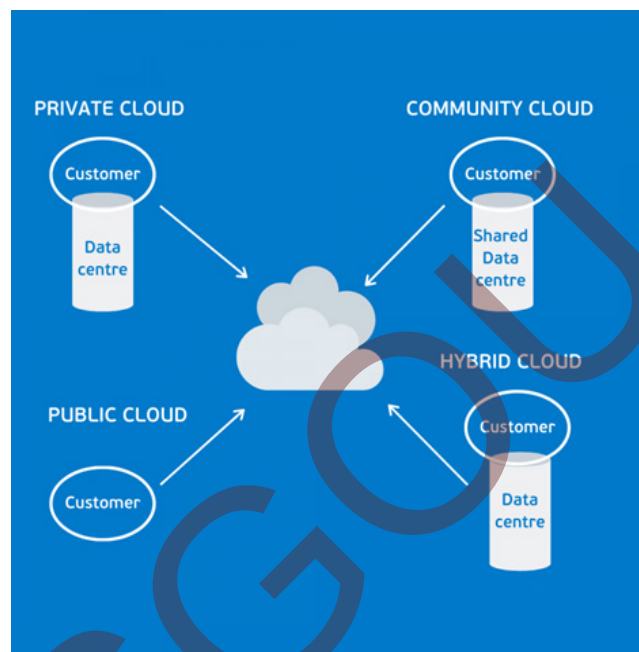


Fig. 4.1.1 Types of Cloud Computing

4.1.2 Types of Cloud Computing

Clouds are classified based on ownership and access.

4.1.2.1 Public Cloud

Think of a public transportation system, such as a city bus or metro. The infrastructure roads, vehicles, fuel, and maintenance are owned and managed by the government or a transport authority. Many passengers use the same system at the same time, but each traveller has their own ticket and destination. Users benefit from the service without worrying about owning or maintaining vehicles.

A public cloud works in a similar way. The cloud infrastructure is owned and managed by a third-party provider and shared among multiple customers, while each customer's data and applications remain logically separated and secure.

In a public cloud model, computing resources are delivered over the internet by third-party providers and shared among multiple users. These resources are shared among multiple users, also known as tenants, using a multi-tenant architecture. Public cloud services are delivered on a pay-as-you-go basis, allowing users to access powerful computing capabilities without investing in physical infrastructure.

Public clouds are widely used because they offer flexibility, rapid deployment, and global availability. Public cloud providers implement security, data isolation, and compliance measures through encryption, access controls, and monitoring mechanisms.

Public cloud services are especially suitable for:

- i. Startups, which require low-cost infrastructure and rapid scalability
- ii. Small and medium businesses, which want to avoid capital expenditure on IT infrastructure
- iii. Online applications, such as websites, mobile apps, streaming services, and e-commerce platforms that experience fluctuating user traffic

For example, a startup can host its website and database on the public cloud and easily scale resources as the number of users grows.

Example:

A leading example of a public cloud provider is Amazon Web Services (AWS). AWS offers a wide range of services, including computing power, data storage, databases, and machine learning tools, which are used by millions of customers worldwide. Companies such as Netflix and Airbnb rely on AWS to deliver services to global users without maintaining their own data centers.

Other major public cloud providers include Microsoft Azure and Google Cloud, both of which support enterprises, governments, and educational institutions.

Advantage of Public Cloud

- i. **Low cost:** Public cloud services eliminate the need for large upfront investments in servers, storage devices, and data centers. Organisations pay only for the resources they use, which significantly reduces capital expenditure and overall IT costs.
- ii. **Easy scalability:** Computing resources such as storage, processing power, and bandwidth can be increased or decreased instantly based on demand. This allows businesses to handle sudden increases in workload, such as seasonal traffic or product launches, without service disruption.
- iii. **No hardware maintenance:** Cloud service providers are responsible for managing, upgrading, and maintaining the underlying hardware and infrastructure. This frees organisations from technical maintenance tasks and allows them to focus on core business activities.

- iv. **Operational flexibility:** Public cloud platforms support rapid deployment of applications and services, enabling businesses to respond quickly to market changes. New environments can be created or removed within minutes, improving agility.
- v. **Support for rapid growth:** The combination of low cost and scalability makes the public cloud ideal for growing businesses and startups. Organisations can start small and expand their usage seamlessly as their user base and operational needs increase.

4.1.2.2 Private Cloud

A private cloud can be compared to an office building that is owned and used exclusively by a single organisation. All rooms, security systems, computers, and facilities are dedicated to that single company, and outsiders cannot access them without permission. Because the organisation fully controls the environment, it can enforce strict security rules, customise the setup, and manage operations according to its specific needs.

A private cloud works in the same way. The cloud infrastructure is dedicated to one organisation only, either hosted within the organisation's own data center or provided by a third party, but not shared with other users. This exclusive usage ensures stronger control, privacy, and security for sensitive data and critical applications.

A Private Cloud is a cloud computing environment where computing resources such as servers, storage, and networking are used exclusively by a single organisation. Unlike the public cloud, the infrastructure is not shared with multiple tenants, which allows greater customisation, governance, and compliance with regulatory requirements.

Private clouds may be on-premises (managed inside the organisation's own data center) or externally hosted by a cloud provider while still remaining dedicated to one organisation. This model is commonly adopted when institutions handle confidential information, mission-critical systems, or strict legal and security obligations.

Security in private clouds is strengthened through controlled access, internal firewalls, dedicated networks, encryption, and continuous monitoring. Because the organisation manages policies and configurations directly, it can better align the cloud environment with business and regulatory standards, while still sharing responsibility with service providers.

Private cloud environments are typically adopted by organisations that require high confidentiality, compliance, and operational control, such as:

- i. Banks and financial institutions, which manage sensitive customer and transaction data
- ii. Government organisations, which store classified or citizen-related information
- iii. Large corporations, which run critical enterprise systems and proprietary business applications

For example, a national bank may operate its core banking software on a private cloud to ensure strict regulatory compliance and full control over data security.

Example:

A well-known provider of private cloud solutions is IBM, which offers enterprise private cloud platforms and hybrid cloud infrastructure for governments, banks, and large enterprises. IBM's solutions allow organisations to maintain dedicated, secure environments while still benefiting from cloud flexibility and automation.

Other major providers supporting private cloud technologies include Microsoft (through Azure Stack and enterprise cloud services) and VMware, widely used for virtualisation-based private cloud infrastructure in large organisations.

Advantages of a Private Cloud (Expanded Point-wise)

1. **High Security:** A private cloud is used exclusively by one organisation, reducing exposure to external threats. Strong authentication, encryption, and monitoring systems can be applied to protect sensitive data.
2. **Full Control Over Infrastructure:** The organisation has complete control over servers, storage, and networking. This allows customisation of configurations, updates, and performance settings according to specific business needs.
3. **Customised Security Policies:** Security rules, firewalls, and compliance measures can be designed to match industry standards such as banking, healthcare, or government regulations.
4. **Better Compliance Support:** Since data remains within a controlled environment, it becomes easier to meet legal and regulatory requirements related to data privacy and protection.
5. **Improved Performance and Reliability:** Resources are not shared with other organisations, which reduces congestion and ensures stable and predictable performance.
6. **Greater Data Privacy:** Sensitive or confidential information stays within the organisation's own environment, lowering the risk of data leaks or unauthorised access.
7. **Flexible Resource Management:** IT teams can allocate computing resources based on internal demand, improving efficiency and reducing dependency on third-party providers.

4.1.2.3 Hybrid Cloud

Think of a hospital with two types of facilities: a highly secure internal ward for confidential patient records and treatments, and a public outpatient section for general consultations and services. The hospital keeps sensitive information strictly inside the secure ward while still using the public-facing area to serve many patients efficiently. This combination allows both strong security and wide accessibility. A hybrid cloud



functions in a similar way. Critical and confidential data are stored in a private cloud, while less sensitive services and high-traffic applications run in a public cloud. Both environments are connected, allowing organisations to balance security, flexibility, and performance.

A Hybrid Cloud is a cloud computing model that integrates private cloud infrastructure with public cloud services, enabling data and applications to move between the two environments. This approach allows organisations to keep sensitive workloads in a secure private setting while using the scalability and cost efficiency of the public cloud for other operations.

Hybrid clouds support workload portability, disaster recovery, and dynamic scaling, making them suitable for modern digital services. Secure networking, encryption, and identity management ensure safe communication between private and public cloud components.

Banks provide a clear real-world example of hybrid cloud usage. They store sensitive customer information, financial records, and core banking systems in private clouds to meet strict regulatory and security requirements.

At the same time, banks use public cloud platforms for customer-facing services such as mobile banking apps, online portals, chat support, and analytics that require high scalability and continuous availability.

This hybrid approach enables banks to maintain data protection and compliance while still delivering fast, reliable digital services to millions of customers.

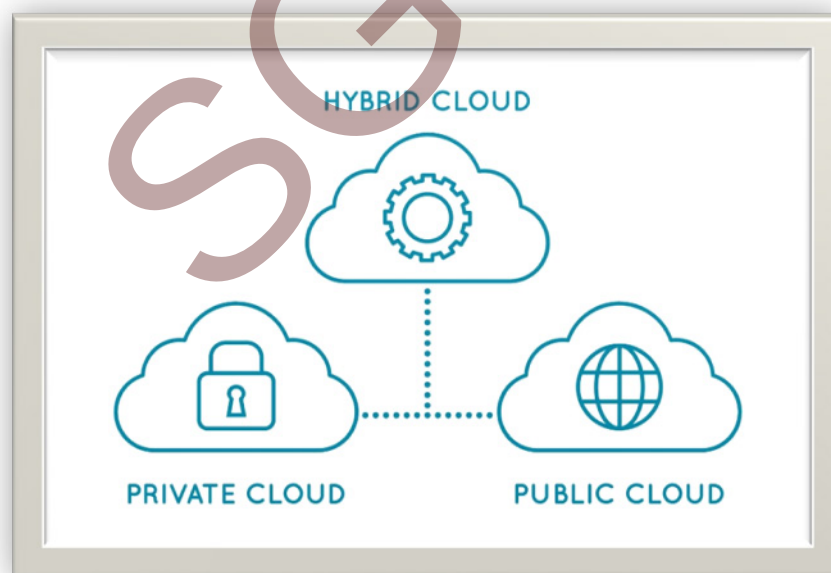


Fig.4.1.2 Hybrid Cloud

Advantages of Hybrid Cloud

- i. **Enhanced security:** Sensitive and critical data can be stored in the private cloud, ensuring strong control, privacy, and regulatory compliance.
- ii. **Cost efficiency:** Organizations can use the public cloud for non-sensitive workloads and high-traffic applications, reducing infrastructure and operational costs.
- iii. **Scalability and flexibility:** Businesses can quickly scale resources in the public cloud during peak demand while maintaining stable core systems in the private cloud.
- iv. **Business continuity and disaster recovery:** Data and applications can be backed up or replicated across both environments, improving reliability and reducing downtime during failures.
- v. **Optimised performance :** Workloads can be distributed between private and public clouds based on performance needs, ensuring efficient system operation.
- vi. **Regulatory compliance :** Hybrid cloud enables organisations in sectors like banking, healthcare, and government to meet legal requirements while still benefiting from cloud innovation.
- vii. **Support for digital transformation:** It allows gradual migration from traditional IT infrastructure to cloud-based systems without disrupting existing operations.

4.1.3 Cloud Service Models

Think of getting a meal in three different ways:

- ◇ You can cook everything at home using rented kitchen space and tools.
- ◇ You can use a ready-made kitchen where ingredients and setup are prepared, and you only cook.
- ◇ Or you can simply order a fully cooked meal and eat it immediately.

Cloud service models work in the same layered manner; each level provides more convenience and less technical responsibility to the user.

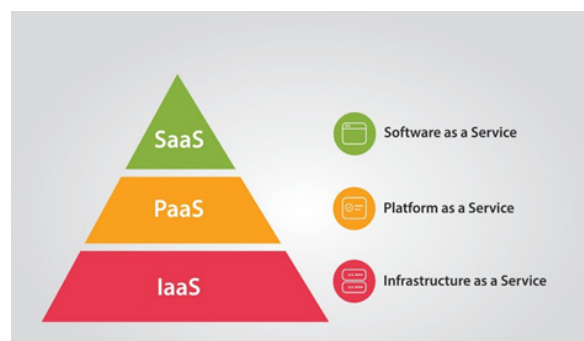


Fig.4.1.3 Cloud Service Models

4.1.3.1 Infrastructure as a Service (IaaS)

You want to open a restaurant but do not wish to construct a building or purchase expensive kitchen equipment. Instead, you rent a fully equipped kitchen space where electricity, storage, and basic facilities are already available. You are free to cook your own menu and manage the business, while the building owner takes care of maintenance and infrastructure. Infrastructure as a Service works in a very similar way. Organisations rent virtual computing infrastructure such as servers, storage, and networking rather than buying and maintaining physical hardware.

Infrastructure as a Service (IaaS) is a cloud computing model that delivers fundamental computing resources through the internet. Users can create virtual machines, store data, and configure networks while the cloud provider manages the physical data centers and hardware.

This model gives organisations maximum control over operating systems, applications, and configurations, while still reducing the burden of hardware ownership and maintenance.

Example:

A widely known real-life case is Netflix, which relies on Amazon Web Services IaaS infrastructure to stream movies and shows to millions of users worldwide. By using cloud-based virtual servers instead of physical ones, Netflix can scale instantly during peak viewing hours and ensure uninterrupted global service.

4.1.3.2 Platform as a Service (PaaS)

Think of a fully prepared workshop for artists. The room, lighting, tables, and essential tools are already arranged. Artists simply walk in and focus on creating their artwork rather than worrying about setting up the space or maintaining equipment. Platform as a Service offers a similar convenience to software developers. The development environment, tools, and runtime platform are already prepared, allowing developers to focus purely on building applications.

Platform as a Service (PaaS) provides a ready-to-use platform where developers can design, build, test, and deploy applications without managing servers, storage, or networking. The cloud provider handles infrastructure, operating systems, and middleware, simplifying the development process.

This significantly reduces development time, operational complexity, and technical overhead, making it ideal for modern software creation.

Example:

A well-known PaaS offering is Google App Engine, which enables developers to deploy applications directly on Google's cloud environment.

Typical users include:

- ◇ Software developers building web or mobile applications
- ◇ IT companies creating scalable digital services for clients

4.1.3.3 Software as a Service (SaaS)

Consider watching a movie on a streaming platform instead of buying a DVD player and discs. You simply open an app, sign in, and start using the service immediately. Updates, storage, and maintenance all happen behind the scenes without any effort from you. Software as a Service follows the same idea—software is delivered ready-to-use through the internet.

Software as a Service (SaaS) is a cloud computing model where complete applications are hosted online and accessed through a web browser or app. Users do not need to install, maintain, or update software because the provider manages everything centrally.

This model ensures automatic updates, easy accessibility, subscription-based pricing, and minimal technical responsibility for users.

Examples and business benefit:

Common examples of Software as a Service applications include Gmail, Microsoft 365, and Zoom, which support communication and productivity needs.

Key business benefits:

- ◇ No installation required, as the software runs in the browser
- ◇ Automatic updates and maintenance handled by the provider
- ◇ Pay-as-you-use or subscription pricing, reducing upfront costs

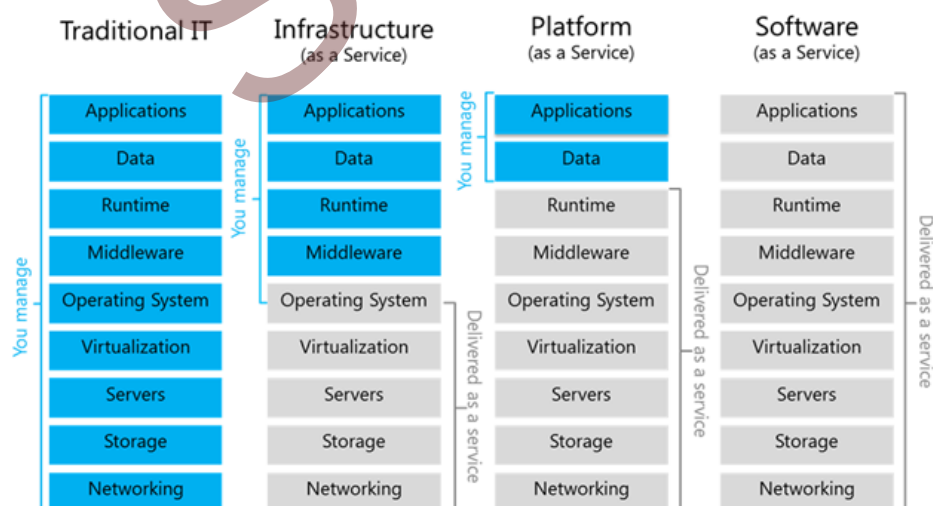


Fig.4.1.4 Cloud Service Models

4.1.4 Serverless Computing

You walk into a fully equipped kitchen where every ingredient, utensil, and appliance is already prepared for you. You simply cook your meal, and once you're done, you leave without worrying about cleaning the kitchen, maintaining the appliances, or paying rent for the space. You only pay for the time you actually use the kitchen. Serverless computing represents an advanced cloud execution model that further abstracts infrastructure management for developers. Instead of buying, setting up, and maintaining servers, developers only focus on writing the code that performs a specific task. The cloud provider automatically handles server management, scaling, and maintenance behind the scenes. Businesses are charged only for the exact time their code runs, which makes this approach cost-efficient and easy to manage.

Example : A well-known example of serverless computing is AWS Lambda. Companies use it to run applications, process data, or respond to events without needing to manage any physical or virtual servers, allowing them to focus purely on innovation and user experience.

Advantages

1. No Server Management

Developers do not need to set up, maintain, or monitor servers. The cloud provider handles all the infrastructure tasks, allowing teams to focus only on writing and improving code.

2. Cost Efficiency

Businesses pay only for the time their code runs, not for idle servers. This reduces unnecessary expenses and makes serverless computing especially useful for applications with irregular or unpredictable usage.

3. Automatic Scaling

Serverless platforms automatically adjust resources based on demand. Whether an application has a few users or millions at once, the system scales up or down without manual intervention.

4. Faster Development and Deployment

Since infrastructure management is removed, developers can build, test, and launch applications more quickly. This speeds up innovation and reduces time to market.

5. High Availability and Reliability

Cloud providers design serverless services to run across multiple systems and locations. This improves uptime and ensures applications continue working even if part of the infrastructure fails.

6. Better Focus on Core Business Logic

Developers spend less time on technical maintenance and more time creating features that improve user experience and business value.

4.1.5 Uses of Cloud Computing

Cloud computing has become a part of everyday digital life, helping individuals and businesses store information, run websites, analyse data, and work together more efficiently. Instead of relying on physical computers or local servers, everything is accessed through the internet, making work faster, safer, and more flexible.

Common uses include the following:

- i. **Data storage and backup:** Files, photos, and important business documents can be stored securely in the cloud and recovered easily if a device is lost or damaged.
- ii. **Website hosting:** Companies can run their websites and online applications on cloud servers that remain available to users around the world at any time.
- iii. **Business analytics:** Organisations use cloud tools to process large amounts of data, discover trends, and make smarter business decisions without needing powerful local computers.
- iv. **Collaboration tools:** Teams can work together in real time using shared documents, video meetings, and messaging platforms, even when members are in different locations.
- v. **Disaster recovery:** If a system fails due to technical problems, cyberattacks, or natural disasters, cloud backups allow businesses to restore their data and continue operations quickly.

4.1.6 Benefits of Cloud Computing for Business

Cloud computing has transformed the way businesses operate by reducing costs, improving flexibility, and making work possible from almost anywhere. Instead of depending on physical equipment and office-based systems, companies can use online services that are easier to manage and scale as they grow.

- i. **Cost Savings :** Businesses no longer need to purchase and maintain expensive hardware or large server rooms. Cloud services allow them to pay only for what they use, which helps control spending and reduce long-term operational costs.
- ii. **Scalability :** One of the biggest advantages of the cloud is flexibility. Companies can quickly increase resources during busy periods and reduce them when demand is low, without needing new physical equipment.
- iii. **Accessibility :** Employees can access files, applications, and systems from any location with an internet connection. This supports remote work, improves collaboration, and allows teams to stay productive even when they are not in the office.



- iv. **Business Continuity** : Cloud platforms provide reliable data backup and disaster recovery options. If technical failures, cyber incidents, or natural disasters occur, businesses can restore their data and continue operations with minimal disruption.

Case Study: Zomato

Introduction

Zomato is a popular online food delivery and restaurant discovery platform that connects millions of customers with restaurants in different cities. To provide fast service, accurate order tracking, and smooth app performance, the company relies heavily on cloud computing technologies.

Problem Statement

As Zomato's user base grew, the company faced several technical challenges. It needed to handle millions of food orders every day, especially during busy meal times such as lunch and dinner. Sudden spikes in traffic could slow down the app or cause service interruptions. In addition, Zomato had to process and analyze large amounts of customer data in real time to improve recommendations, delivery efficiency, and user experience. Managing all of this with traditional servers would have been expensive, complex, and difficult to scale.

Solution

To overcome these challenges, Zomato adopted cloud computing. Cloud platforms allow the company to automatically scale its computing resources during peak hours and reduce them when demand is lower. This ensures the app remains fast and reliable even when millions of users place orders simultaneously. Cloud-based data analytics tools also help Zomato analyze customer preferences, order patterns, and delivery performance in real time. This enables better restaurant recommendations, optimised delivery routes, and improved overall service quality.

Conclusion

By using cloud computing, Zomato successfully manages heavy traffic, processes large volumes of orders, and gains valuable insights from customer data. The cloud provides flexibility, scalability, and reliability, allowing the company to deliver a smooth and efficient food-ordering experience. This case clearly shows how cloud technology can support the rapid growth and operational needs of modern digital businesses.

4.1.7 Security Mechanisms

Think of a company moving all its important files from a locked office cabinet to a high-tech digital vault in another city. The new vault is more advanced and convenient, but the company must fully trust that the doors are secure, access is controlled, and

nothing valuable can be stolen or damaged. This feeling of responsibility and caution reflects how businesses approach security when shifting to the cloud.

As organisations migrate their systems and data to cloud platforms, protecting sensitive information becomes extremely important. Cloud data security involves safeguarding files, customer details, financial records, and applications from cyberattacks, data leaks, and unauthorised access. It includes measures such as encryption, secure authentication, regular monitoring, and backup systems. Without strong security practices, the benefits of cloud computing could be overshadowed by serious risks.

Example: A major technology company like Microsoft invests heavily in cloud security for its Azure platform. It provides built-in encryption, identity protection, and continuous threat monitoring to help businesses keep their data safe while using cloud services.

As more businesses store important information in the cloud, strong security measures become essential. Cloud providers implement multiple security layers, while users remain responsible for securing their data, access controls, and configurations.

1. **Data Encryption** : Data encryption is one of the most important security techniques used in cloud computing. It transforms readable information into an unreadable coded format so that unauthorised users cannot understand it. Encryption protects both stored data and data being transferred over the internet. For example, when a customer enters credit card details on an online shopping website hosted in the cloud, encryption ensures that even if the data is intercepted, it cannot be misused without the correct decryption key.
2. **Identity and Access Management (IAM)** : Identity and Access Management controls who can access cloud resources and what actions they are allowed to perform. Instead of giving full access to everyone, permissions are assigned based on job roles, and additional verification methods like multi-factor authentication are often required. For instance, in a company's cloud-based document system, employees may only view files related to their department, while managers can edit or approve them, reducing the risk of internal data misuse.
3. **Firewalls and Network Security** : Cloud environments use advanced firewalls and network protection systems to monitor and filter incoming and outgoing traffic. These tools block suspicious connections, prevent unauthorised entry, and detect cyberattacks in real time. As an example, an online banking application hosted in the cloud relies on strong firewall rules and intrusion detection systems to stop hackers from attempting unauthorised logins or stealing financial information.
4. **Data Backup and Disaster Recovery** : Regular data backups ensure that important information is not permanently lost due to accidental deletion, hardware failure, or cyberattacks such as ransomware. Disaster recovery systems allow businesses to quickly restore services and continue operations with minimal downtime. For example, if a company's main database becomes corrupted, a recent cloud backup can be used to recover customer records and resume normal business activities.



5. **Security Monitoring and Threat Detection** : Cloud providers continuously monitor system activity to identify unusual behaviour, malware infections, or unauthorised access attempts. Automated alerts and intelligent detection tools help security teams respond quickly before serious damage occurs. For instance, if a user suddenly tries to download a massive amount of confidential data at an unusual time, the monitoring system can flag the activity and temporarily block access for investigation.
6. **Compliance and Security Standards** : To ensure trust and legal protection, cloud platforms follow internationally recognised security standards and data protection regulations. These compliance frameworks guide how data is stored, processed, and secured. For example, a healthcare organisation using cloud services must follow strict privacy rules to protect patient information, and certified cloud providers help them meet these legal requirements while maintaining strong security practices.

4.1.8 Cryptography

Suppose you want to send an important secret message to a friend, but you know others might try to read it along the way. To keep it safe, you write the message using a special code that only your friend understands. Anyone else who sees the message will find it meaningless. This simple idea of hiding information through coding is similar to how cryptography works in the digital world.

Cryptography is the science of securing information by transforming readable data into an encoded format using mathematical algorithms. Only people who have the correct key or permission can decode and understand the original data. The main purposes of cryptography are to maintain data confidentiality so that private information stays secret, ensure data integrity so that information is not altered during transmission, and provide secure communication between users and systems. It plays a vital role in protecting sensitive digital activities such as financial transactions, passwords, and personal communications.

Example : A common example of cryptography can be seen in online banking transactions. When a user logs into a banking website or transfers money, encryption techniques protect the account details and transaction data from hackers. This allows customers to perform financial activities over the internet with confidence and security.

4.1.8.1 Applications of Cryptography

1. **Secure Online Banking and Payments** : Cryptography is widely used to protect financial transactions carried out over the internet. When users log into banking websites, transfer money, or make digital payments, encryption secures sensitive information such as account numbers, passwords, and transaction details. This prevents hackers from stealing or altering financial data during transmission.

2. **Data Protection and Privacy** : Organizations use cryptography to safeguard confidential data stored in computers, cloud systems, and mobile devices. Personal records, business documents, and customer information are encrypted so that even if unauthorized individuals access the storage system, the data remains unreadable without the proper key.
3. **Secure Communication** : Messaging apps, emails, and video-calling platforms rely on cryptographic techniques to ensure private communication between users. End-to-end encryption allows only the sender and receiver to read the messages, protecting conversations from interception or surveillance.
4. **Authentication and Digital Signatures** : Cryptography helps verify the identity of users and ensures that digital documents are genuine. Digital signatures confirm that a message or file has not been changed after being sent and that it truly comes from the claimed sender. This is especially important in legal documents, software distribution, and online contracts.
5. **E-commerce and Online Services** : Online shopping websites use encryption protocols to secure login credentials, payment information, and order details. This builds customer trust and enables safe electronic commerce across the internet.

4.1.8.2 Benefits of Cryptography

1. **Data Confidentiality** : Cryptography keeps sensitive information private by converting it into unreadable code. Only authorized users with the correct decryption key can access the original data.
2. **Data Integrity** : It ensures that information remains accurate and unaltered during storage or transmission. Any unauthorized modification can be detected immediately.
3. **Authentication and Trust** : Cryptographic methods verify user identities and confirm the source of digital messages, creating trust in online interactions and transactions.
4. **Protection Against Cyberattacks** : By securing communications and stored data, cryptography reduces the risk of hacking, identity theft, and financial fraud.
5. **Support for Digital Economy** : Secure encryption makes online banking, e-commerce, cloud computing, and digital communication possible, enabling modern digital business and global connectivity.

4.1.9 Digital Signature

Think about signing an important paper document with your handwritten signature to show that it truly comes from you and has not been changed. In the digital world, where documents are shared through computers instead of paper, a secure electronic method is needed to provide the same level of trust. This is where a digital signature plays an important role.



A digital signature is an electronic technique used to confirm the authenticity of the sender and the integrity of a digital document. It ensures that the document genuinely comes from the claimed person or organisation and that its contents have not been altered after signing. Digital signatures use cryptographic techniques to ensure authentication, integrity, and non-repudiation of digital documents, making online communication and transactions secure and trustworthy. Digital signatures are commonly applied in online contracts, where agreements are signed electronically without physical paperwork. They are also used in the electronic filing of income tax, allowing individuals and businesses to submit official documents securely through government systems. In e-commerce transactions, digital signatures help verify approvals, payments, and important confirmations between buyers and sellers.

Example : Many government online service portals rely on digital signatures to approve applications, verify submitted documents, and provide legally valid authorisation without requiring citizens to visit offices in person. This makes public services faster, more secure, and more convenient.

4.1.9.1 Applications of Digital Signatures

1. **Online Contracts and Agreements :** Digital signatures allow individuals and businesses to sign legal documents electronically without printing or scanning papers. This makes contract approval faster, reduces paperwork, and enables agreements to be completed from any location.
2. **E-filing of Government Documents :** Many government services use digital signatures for secure submission of forms such as income tax returns, license applications, and official registrations. This ensures that the documents are genuine and submitted by the correct person.
3. **E-commerce Transactions :** In online shopping and digital payments, digital signatures help verify approvals, purchase confirmations, and secure communication between buyers, sellers, and payment systems. This builds trust in electronic business activities.
4. **Secure Email and Communication :** Digital signatures can be attached to emails to confirm the sender's identity and ensure that the message content has not been changed during transmission. This is especially useful in corporate and legal communication.
5. **Software Distribution and Updates :** Technology companies digitally sign their software so users can verify that the program is authentic and has not been modified by attackers. This protects computers and mobile devices from malicious software.

4.1.9.2 Benefits of Digital Signatures

1. **Authentication of Identity :** Digital signatures confirm the true identity of the sender or signer, reducing the risk of impersonation or fraud in online transactions.

2. **Data Integrity** : They ensure that the signed document or message has not been altered after signing. Any change in the content invalidates the signature, immediately indicating tampering.
3. **High Security** : Digital signatures use strong cryptographic techniques, making them much more secure and reliable than simple typed names or scanned handwritten signatures.
4. **Time and Cost Efficiency** : Electronic signing removes the need for printing, physical delivery, and manual processing, saving both time and operational expenses for organisations.
5. **Legal Validity and Trust** : In many countries, digitally signed documents are legally recognised, allowing businesses and governments to conduct secure and paperless transactions with confidence.

4.1.9.3 Comparison between digital signatures and handwritten signatures

Table 4.1.1 Difference between digital signatures and handwritten signatures

Basis of Comparison	Digital Signature	Handwritten Signature
Form	Electronic and created using cryptographic technology	Written manually on paper using a pen
Security Level	Highly secure and difficult to forge due to encryption and verification keys	Easier to copy or forge compared to digital methods
Verification Method	Verified electronically through digital certificates and authentication systems	Verified visually by comparing with a known signature
Data Integrity	Detects any change made to the document after signing	Cannot easily detect if the document content is altered
Usage Environment	Used in online transactions, e-filing, emails, and digital contracts	Used in physical documents, cheques, and paper agreements
Speed and Convenience	Instant signing and sharing from any location via the internet	Requires physical presence, printing, and manual handling

Legal Acceptance	Legally valid in many countries under digital signature laws	Traditionally accepted as legal proof of consent
Cost and Paper Use	Paperless and reduces administrative costs	Requires paper, printing, and storage space

4.1.10 Firewall

Think of a secure office building with a trained security guard standing at the entrance. Every person who tries to enter or leave is carefully checked. Unauthorised visitors are stopped at the door, while approved staff members are allowed inside. This protective checkpoint works quietly in the background but plays a crucial role in keeping the building safe. A firewall performs a very similar job in the digital world.

A firewall is a security system that continuously monitors and controls the flow of incoming and outgoing network traffic. It acts as a protective barrier between a trusted internal network and untrusted external sources such as the internet. By applying predefined security rules, a firewall blocks unauthorised access, filters suspicious data, and protects internal systems from cyber threats. This helps organisations maintain the confidentiality and safety of their digital resources. Modern organisations rely heavily on firewalls to defend company networks from hacking attempts, malware, and unauthorised intrusions. Whether the business is small or large, firewalls form one of the first and most essential layers of cybersecurity, ensuring that sensitive company data and communication remain protected.

Case Study : Cloud Security at Google

Google provides widely used cloud services such as Google Drive and Gmail, where billions of users store personal and professional data. Protecting this enormous amount of information requires extremely strong and reliable security measures.

To safeguard user data, Google combines multiple layers of protection.

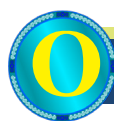
- ◇ **Strong encryption** keeps stored and transmitted data unreadable to unauthorised users.
- ◇ **Firewalls** monitor and filter network traffic to block malicious access attempts.
- ◇ **Multi-layer security architecture** ensures that even if one defence layer is challenged, additional protections remain active.

Through this layered cloud security strategy, Google maintains high levels of privacy, trust, and reliability for its global users. This case highlights how powerful firewall systems and encryption technologies work together to secure modern cloud environments.



Recap

- ◇ Cloud computing provides on-demand access to computing resources over the internet, reducing the need for physical infrastructure and enabling flexible business operations.
- ◇ Different deployment models (public, private, hybrid) serve different security and scalability needs depending on organisational requirements.
- ◇ Service models such as IaaS, PaaS, and SaaS define levels of user control and responsibility in cloud environments.
- ◇ Security mechanisms like encryption, IAM, firewalls, backups, and monitoring protect cloud data and systems from cyber threats and unauthorised access.
- ◇ Cryptography, digital signatures, and firewalls ensure confidentiality, integrity, authentication, and secure communication in modern digital business operations.



Objective Questions

1. What is the delivery of computing services over the internet called?
2. Which cloud model is shared among multiple users?
3. Which cloud is dedicated to a single organisation?
4. Name the cloud model combining public and private clouds.
5. What does IaaS provide mainly?
6. Which service model delivers ready-to-use software online?
7. What technique converts data into unreadable form?
8. Which system controls network traffic for security?
9. What verifies the authenticity of digital documents?
10. Which cloud feature allows resource expansion during demand?
11. What protects data through backup and recovery?
12. Which management system controls user permissions in cloud security?





Answers

1. Cloud computing
2. Public cloud
3. Private cloud
4. Hybrid cloud
5. Virtual infrastructure
6. Software as-a-Service
7. Data encryption
8. Firewall system
9. Digital signature
10. Scalability
11. Disaster recovery
12. Identity management



Self Assessment Questions

1. Explain the concept and characteristics of cloud computing.
2. Compare public, private, and hybrid cloud deployment models.
3. Describe IaaS, PaaS, and SaaS with suitable examples.
4. Discuss major cloud security mechanisms used to protect data.
5. Explain the role of cryptography and digital signatures in secure online transactions.



Assignments

1. Identify any cloud service you use daily and explain its benefits for productivity or storage.
2. Compare two cloud providers (e.g., AWS and Google Cloud) based on services and pricing.
3. Demonstrate how file backup works using a cloud storage platform.
4. Study a real cyber-security incident and explain how cloud security mechanisms could prevent it.
5. Prepare a short report on how digital signatures enable paperless business transactions.



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Unit - 2

M-Commerce and Other Emerging Technologies



Learning Outcomes

After completing this Unit, the learner will be able to:

- ◇ aware of mobile commerce, artificial intelligence, and machine learning applications in business.
- ◇ identify real-world applications of AI and ML across industries such as retail, banking, and logistics.
- ◇ analyse the advantages of AI-driven decision-making and automation in modern organisations.
- ◇ differentiate between Artificial Intelligence and Machine Learning based on scope and functionality.



Prerequisite

A young entrepreneur is travelling to college on a crowded bus while managing a small online business entirely from a smartphone. He is checking customer orders, receiving digital payments, tracking deliveries, and even using smart recommendations to promote products. Without visiting a bank, office, or physical store, the student is already participating in a powerful digital economy shaped by mobile commerce, artificial intelligence, connected devices, and sustainable computing practices. Advances in mobile and intelligent technologies have significantly reduced the need for large physical infrastructure. This real-world shift shows how modern business is no longer limited by location, time, or manual processes but is increasingly driven by smart, mobile, and data-enabled technologies.

This unit introduces the major emerging technologies transforming contemporary business environments, such as mobile commerce, mobile computing, green computing, Web 3.0, the Internet of Things, Artificial Intelligence, and Machine Learning. Together, these concepts help learners understand how organisations



improve efficiency, enhance customer experience, and make intelligent decisions in a rapidly evolving digital world. For BBA students, this knowledge forms an essential foundation for analysing modern business models and preparing for technology-driven management practices in the future.



Keywords

Artificial Intelligence, Machine Learning, Automation, Prediction, Personalisation



Discussion

4.2.1 M-Commerce (Mobile Commerce)

A common retail situation illustrates the growing role of mobile commerce in everyday transactions. You could wait and pay at the counter or, with just a few taps on your smartphone, you could order everything on the list online while still standing there and have it delivered home. You don't need a computer, cash, or even to leave the queue; your mobile phone becomes your shopping cart, wallet, and checkout counter all at once.

This everyday convenience reflects how mobile commerce works, turning your smartphone into a portable marketplace that lets you buy and sell goods or services anytime and anywhere.

Mobile Commerce, commonly abbreviated as M-Commerce, refers to buying and selling goods and services using mobile devices such as smartphones and tablets over wireless networks. It is essentially a subset of e-commerce that focuses specifically on mobile technology, allowing users to browse products, make purchases, pay bills, book tickets, transfer money, and even manage bank accounts directly from their handheld devices without needing a desktop computer. This shift has been driven by the widespread adoption of smartphones, improved internet connectivity, and the development of mobile-friendly apps and secure payment systems.

In simple terms, M-Commerce is e-commerce conducted through mobile phones and tablets, integrating shopping, banking, payments, ticketing, and more into one seamless mobile experience.

Example: A well-known example of mobile commerce in action is Amazon. Its mobile app allows millions of users to browse products, read reviews, place orders, and complete payments, all from their smartphones. Features like one-click purchasing,

personalised recommendations, push notifications for deals, and mobile-optimised checkout make shopping faster and more convenient than ever. Mobile platforms contribute substantially to online retail transactions, indicating the growing importance of mobile shopping.

Mobile commerce is the use of wireless handheld devices to conduct commercial transactions online. Some examples of M-Commerce include the following::

- i. Ordering food through mobile apps
- ii. Mobile banking
- iii. Mobile ticket booking
- iv. Digital payments using mobile wallets

4.2.2 Applications of M-Commerce

1. **Mobile Banking** : Mobile banking applications provide comprehensive banking services through handheld devices. Mobile banking is one of the most important applications of M-Commerce. It allows customers to check account balances, transfer funds, and pay utility bills directly through their smartphones. Secure login systems, encryption, and real-time transaction updates make banking faster, safer, and available 24/7 without visiting a physical branch.

Example: The State Bank of India provides mobile banking services through its popular YONO app, enabling millions of users to manage their finances, make payments, and access banking services anytime and anywhere.

2. **Mobile Shopping** : Mobile shopping allows users to browse and purchase products conveniently through mobile devices. Shopping becomes a quick, everyday activity rather than a planned outing. Mobile shopping allows customers to browse products, compare prices, and purchase items using mobile apps or websites. Because smartphones are always accessible, people can shop anytime and from anywhere, making the buying process more convenient and personalised.

Example: Major e-commerce platforms like Amazon and Flipkart have mobile apps that provide fast checkout, personalised recommendations, and easy payment options, making mobile shopping a routine part of daily life.

3. **Mobile Payments** : Consider buying a cup of coffee at a small shop and paying instantly by scanning a QR code with your phone—no cash, no card, and no waiting for change. The transaction completes in seconds with just a tap. Mobile payments are a key feature of M-Commerce, enabling users to pay digitally through UPI, mobile wallets, and QR code-based systems. These methods reduce dependence on physical cash and provide quick, secure, and contactless transactions for everyday purchases.

Paytm played a major role in popularising mobile payments in India by offering wallet services, QR payments, bill payments, and money transfers through a simple smartphone app.



4. **Ticketing and Reservations :** Imagine planning a sudden weekend trip. Instead of standing in long queues at railway counters or travel agencies, you book train tickets, flight seats, or movie passes directly from your phone while relaxing at home. Your ticket arrives instantly as a digital confirmation.

M-Commerce enables fast and paperless ticketing and reservation services, allowing users to book transportation and entertainment tickets through mobile apps. Digital tickets reduce waiting time, prevent loss of paper tickets, and simplify travel planning. Common uses of M-commerce include the following:

- ◇ Train ticket booking
- ◇ Flight reservations
- ◇ Movie ticket purchases

4.2.3 Advantages of M-Commerce

1. **Convenience :** If you need to buy a birthday gift late at night when all nearby shops are closed. With just a smartphone in hand, you can browse products, place an order, and arrange delivery within minutes without leaving your room. The store is always open in the mobile world. One of the greatest advantages of M-Commerce is convenience. Users can access shopping, banking, payments, and other services anytime and from anywhere using mobile devices connected to the internet. This flexibility removes time and location barriers, making everyday tasks easier and faster.
2. **Speed :** Think about paying for groceries by simply scanning a QR code instead of waiting in a long billing queue. The payment completes in seconds, and you walk away without delay. M-Commerce enables quick browsing, instant payments, and real-time confirmations. Saved payment details, one-click purchasing, and fast mobile networks significantly reduce transaction time compared to traditional shopping or even desktop-based e-commerce.
3. **Personalisation:** Suppose you frequently search for sports shoes on your phone. Soon, your shopping apps begin showing discounts, recommendations, and new arrivals related to sports footwear, almost as if the store understands your preferences.

Mobile platforms can analyse user behaviour, search history, and purchase patterns to provide personalised product suggestions and special offers. This improves customer satisfaction and helps businesses connect with users in a more meaningful and targeted way.

4. **Cost Effective** Running a physical store requires rent, electricity, staff salaries, and maintenance. In contrast, selling products through a mobile app allows a business to reach customers without maintaining many physical outlets. M-Commerce helps businesses reduce infrastructure and operational expenses. Digital transactions, automated services, and online marketing lower overall costs while still allowing companies to serve a large number of customers efficiently.

5. **Wider Reach :** A small handmade-craft seller in a remote village can now sell products to customers living in distant cities simply through a mobile platform. Distance is no longer a barrier to business. Because smartphones and mobile internet are widely available, M-Commerce enables businesses to reach customers in rural and geographically distant areas. This expands market opportunities and supports inclusive economic growth.

4.2.3.1 Limitations of M-Commerce

1. **Security Risks :** M-Commerce transactions can be vulnerable to cyberattacks such as phishing, malware, and unauthorised access to mobile wallets. Hackers may steal login details or payment information if security measures like encryption or two-factor authentication are weak. Phishing attacks can result in unauthorised access to mobile wallets and financial loss.
2. **Small Screen Size :** Mobile devices have smaller screens compared to computers, making it harder to view detailed product information or complete complex forms. This limitation can reduce user convenience and may lead to mistakes while entering payment or delivery details. For instance, a customer might accidentally select the wrong product size because the full description is not clearly visible.
3. **Internet Dependency :** M-Commerce relies heavily on a stable internet connection to browse products, make payments, and receive confirmations. Poor or slow connectivity can interrupt transactions and cause frustration for users. For example, a payment might fail midway if the mobile network disconnects during checkout.
4. **Privacy Issues :** Mobile apps often collect personal data such as location, contact details, and shopping behaviour, which may be misused if not properly protected. Weak privacy policies or data breaches can expose sensitive user information to third parties. For example, an app sharing user data without consent could lead to spam messages or identity theft.

4.2.4 Mobile Computing

Mobile computing enables users to access digital resources and services while moving between locations, replying to emails through a smartphone, and submitting an assignment using mobile internet. The student is not in a classroom or computer lab, yet learning and communication continue smoothly. This simple, everyday scene shows how technology now moves along with us instead of waiting for us to sit in one place.

Mobile Computing refers to the use of portable electronic devices that allow people to access information, applications, and online services while they are on the move. It combines wireless communication, portable hardware, and cloud-based data so that work, study, shopping, or entertainment can happen anytime and anywhere. In short, computing is no longer limited to a fixed desktop location, it travels with the user.



Common devices used in mobile computing include smartphones, tablets, and laptops connected through Wi-Fi or mobile data. These devices are lightweight, battery-powered, and designed for constant connectivity. Because of this portability, they have become an essential part of daily personal and professional life.

Example: Popular mobile devices enable users to access applications, cloud services, and online communication while on the move., attend online meetings, store files in the cloud, and use thousands of mobile applications while moving from place to place. The company's ecosystem shows how mobile computing can integrate communication, entertainment, and productivity into a single portable experience. This demonstrates how strongly mobile computing has shaped today's digital world.

4.2.4.1 Applications in Business

1. **Online education and training :** Mobile computing allows students and employees to attend virtual classes, training sessions, and webinars from anywhere. Learning is no longer limited to classrooms or offices. For example, an employee can complete a professional course using a smartphone while traveling.
2. **Mobile banking and digital payments :** Businesses and customers can transfer money, pay bills, and complete purchases instantly through mobile apps. This speeds up financial transactions and reduces the need for physical bank visits. For instance, a customer can pay for shopping using a mobile wallet within seconds.
3. **Navigation and delivery services :** Mobile devices provide GPS-based navigation that helps businesses manage transportation and delivery efficiently. Drivers can find the fastest routes and track locations in real time. A delivery company, for example, uses mobile maps to ensure parcels reach customers quickly.
4. **Healthcare monitoring and services :** Doctors and patients use mobile devices for health tracking, online consultations, and medical record access. This improves healthcare accessibility, especially in remote areas. For example, a patient can check heart rate through a mobile health app and share the data with a doctor.
5. **Remote work and communication :** Employees can attend meetings, share files, and collaborate with teams from any location using mobile internet. This supports flexible work environments and business continuity. For instance, staff can join a video meeting from home using a tablet or smartphone.

Advantages of Mobile Computing

1. **Convenience and accessibility :** Users can access important information anytime and anywhere without depending on a fixed computer. This makes daily tasks faster and easier. For example, a manager can check business reports on a phone while traveling.

2. **Improved productivity :** Quick communication, instant data sharing, and real-time updates help people complete work efficiently. Businesses can respond to customers and problems without delay. For instance, employees can reply to urgent emails immediately through mobile devices.
3. **Supports modern mobile lifestyle :** Mobile computing fits today's fast-moving world where people expect speed, flexibility, and constant connectivity. It allows smooth balance between personal and professional activities. For example, someone can shop online, attend a meeting, and message friends using the same device.

4.2.5 Green Computing

A modern school or office where technology works in harmony with nature. In this place, computers and lights are switched on only when needed, energy-efficient laptops replace bulky power-consuming desktops, and students submit homework online instead of using paper. Old or damaged electronic devices are carefully recycled rather than thrown into the environment, reducing pollution and electronic waste. Even the building may use natural light or renewable energy to power the systems. Through these small but thoughtful actions, technology continues to support learning and work while protecting the Earth's resources, showing how green computing creates a balance between digital progress and environmental care. Green Computing refers to the environmentally responsible and eco-friendly use of computers, electronic devices, and IT resources. Its main goal is to reduce the negative impact of technology on nature while still enjoying the benefits of digital innovation. In essence, it is about using technology wisely so that progress and environmental care move forward together.

Example: A well-known example is Google, which operates energy-efficient data centers and invests heavily in renewable energy sources like solar and wind power. By doing so, the company reduces its carbon footprint while still supporting billions of online users every day. This shows how large technology companies can combine innovation with environmental responsibility.

4.2.5.1 Objectives of Green Computing

1. **Reduce energy consumption :** The first objective of green computing is to lower the amount of electricity used by computers and IT equipment. This is achieved by using energy-efficient hardware, power-saving modes, and shutting down systems when they are not in use. Example: An office installs energy-efficient monitors and enables automatic sleep mode to reduce electricity bills and environmental impact.
2. **Minimise electronic waste (e-waste) :** Another important goal is to reduce the harmful waste created by old or unused electronic devices. This can be done by repairing, reusing, donating, or recycling computers instead of throwing them away. Example: A company sends outdated computers to certified recycling centers or donates working devices to schools.



3. **Promote sustainable IT practices :** Green computing also encourages smarter and more eco-friendly ways of using technology in daily operations. Practices like cloud computing, virtualisation, digital documentation, and reduced paper printing help conserve natural resources.

Example: A business stores files in cloud storage and uses e-bills instead of printed documents, saving paper and energy.

4.2.5.2 Application in Business of Green Computing

1. **Energy-efficient office operations :** Businesses use energy saving computers, LED monitors, and automatic power-management systems to reduce electricity consumption. This lowers operating costs and protects the environment at the same time.

Example: An office installs smart power systems that switch off computers after working hours.

2. **Cloud computing and virtualisation :** Companies store data on cloud servers and use virtual machines instead of many physical computers. This reduces hardware usage, saves space, and decreases energy consumption in data centers.

Example: A company uses cloud storage instead of maintaining multiple physical servers in the office.

3. **Digital documentation and paperless work :** Organisations replace printed documents with emails, PDFs, and online record systems. This helps in saving paper, ink, and storage space while making information easier to manage.

Example: Businesses sending e-invoices instead of printed bills.

4. **Responsible e-waste management :** Firms recycle old computers, safely dispose of electronic parts, or donate usable devices. This prevents environmental pollution caused by harmful electronic materials.

Example: A company giving old but working computers to schools instead of throwing them away.

4.2.5.3 Advantages of Green Computing

1. **Cost savings :** Lower energy consumption and reduced paper use help businesses save money in the long run. Maintenance and hardware costs also decrease due to efficient resource usage.

Example: Reduced electricity bills after installing energy-efficient systems.

2. **Environmental protection :** Green computing reduces carbon emissions, pollution, and electronic waste. This supports sustainable development and protects natural resources for the future.

Example: Using renewable-energy-powered data centers to cut pollution.

3. **Improved corporate image** : Environment-friendly practices build a positive reputation among customers, investors, and society. Many people prefer companies that care about sustainability.

Example: Businesses promoting eco-friendly policies in their branding.

4. **Better efficiency and productivity** : Modern green technologies like cloud computing and virtualisation improve system performance and flexibility. Employees can access data easily while using fewer physical resources.

Example: Staff working smoothly through cloud-based systems without heavy hardware.

4.2.6 Web 3.0 (Semantic Web)

You are searching online for “best budget laptop for online classes.” Instead of showing thousands of unrelated links, the internet directly understands your need, compares prices, checks reviews, and suggests the most suitable laptop. It may even remind you of brands you previously searched for and display results within your budget. This smart, meaningful interaction shows how the web is becoming more intelligent and helpful.

Web 3.0, also called the Semantic Web, is the next generation of the internet where machines can understand the meaning of data, not just display information. It uses technologies like artificial intelligence, machine learning, and linked data to provide smarter and more personalised online experiences. Web 3.0 enhances the internet by enabling semantic understanding, data interoperability, and intelligent information processing.

Example:

- ◇ Smart search results that understand user intent rather than just keywords.
- ◇ Personalised recommendations on shopping or streaming platforms based on past behaviour.
- ◇ Voice-based assistants that answer questions, set reminders, or control smart devices.

4.2.6.1 Applications in Business

1. **Better customer insights** : Businesses can understand customer preferences and behaviour more accurately. This helps in creating targeted marketing strategies. For example, an online store recommends products based on previous purchases.
2. **Improved decision-making** : Smart data analysis allows companies to predict trends and demand. Managers can make faster and more informed business



decisions. For instance, predicting which product will sell more in a particular season.

3. **Enhanced customer experience** : Personalised services increase customer satisfaction and loyalty. Chatbots and virtual assistants provide instant support. Example: a website assistant guiding users to the exact product they need.

4.2.6.2 Advantages of Web 3.0

1. **More accurate and meaningful search** : Users receive relevant information quickly without searching multiple websites. This saves time and effort.

Example: getting a direct answer instead of many unrelated links.

2. **High level of personalisation** : Content, ads, and services are tailored to individual needs. This improves user engagement and convenience. For example, music or movie suggestions based on listening history.

3. **Automation and efficiency** : Smart systems can perform tasks automatically using intelligent data processing. This increases productivity for both users and businesses.

Example: voice assistants scheduling meetings or sending reminders.

4.2.7 Internet of Things (IoT)

You are waking up in the morning, and your alarm clock automatically turns on the room lights, starts the coffee maker, and shows the weather on your phone. When you leave home, the door locks itself, and the air conditioner switches off to save electricity. All these devices are quietly talking to each other through the internet, making daily life smoother without much effort. This simple scene reflects how technology is slowly blending into our everyday routines. The Internet of Things (IoT) makes it possible.

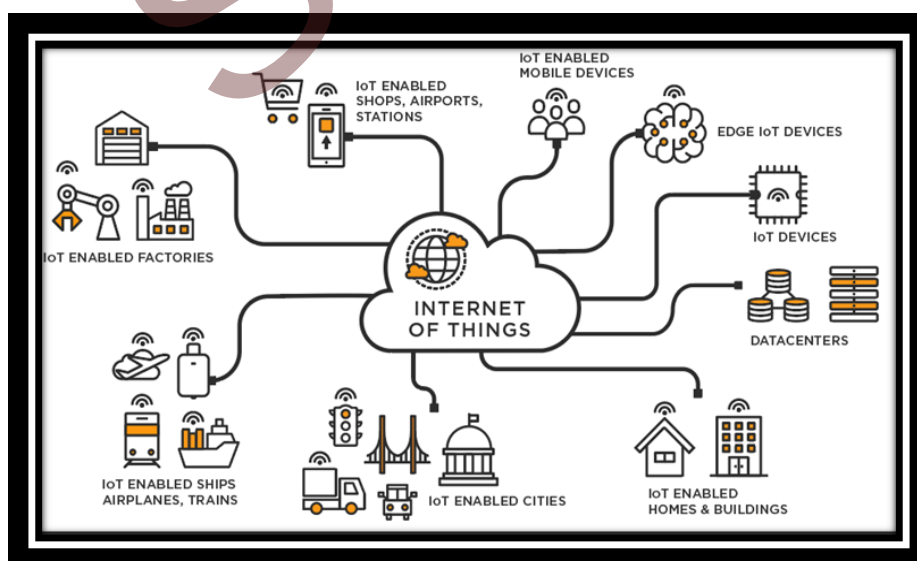


Fig.4.2.1 Internet of Things

The Internet of Things (IoT) refers to a network of physical devices connected to the internet that can collect, share, and act on data without constant human control. These devices include sensors, smart appliances, wearable gadgets, vehicles, and industrial machines. In short, IoT allows ordinary objects to become “smart” by enabling communication, automation, and real-time decision-making.

Examples:

Common examples include smart home devices like automatic lights, smart thermostats, and security cameras. Wearable fitness bands that track steps, heart rate, and sleep patterns are also part of IoT. Even smart cars with navigation, sensors, and internet connectivity show how IoT is expanding into transportation and daily living.

4.2.7.1 Applications in Business

1. **Smart inventory and supply chain management :** Businesses use sensors and connected systems to track goods in real time. This reduces loss, improves delivery speed, and helps maintain accurate stock levels.
2. **Predictive maintenance in industries :** Machines with IoT sensors can report performance data and warn about possible failures before breakdowns occur. This saves repair costs and prevents production delays.
3. **Customer experience and personalization :** Retail stores use IoT devices to understand customer behavior and offer personalized services. Smart shelves, digital payments, and location-based offers improve shopping convenience.
4. **Energy management :** Companies monitor electricity usage through smart meters and automated controls. This helps reduce energy waste and operational expenses.

4.2.7.2 Advantages of IoT

1. **Greater efficiency :** Automated data collection and real-time monitoring allow systems to work without constant human supervision. This reduces manual errors and speeds up daily operations in homes, offices, and industries. As a result, tasks are completed more quickly and with higher accuracy.
2. **Cost savings :** Technologies like predictive maintenance help detect problems in machines before they become serious and expensive. Smart energy management systems also reduce electricity consumption and avoid waste. Together, these improvements lower operational costs and increase overall profitability.
3. **Better decision-making :** Continuous data from connected devices provides useful and up-to-date information for managers and organisations. This data helps in identifying trends, predicting future needs, and solving problems more effectively. Therefore, business decisions become more accurate, timely, and evidence-based.



4. **Improved quality of life** : Smart homes, healthcare monitoring devices, and connected transportation systems make everyday living safer and more convenient. People can control appliances remotely, track their health in real time, and travel more efficiently. These benefits lead to greater comfort, safety, and overall well-being.

Use Case (IoT in Logistics)

A well-known example of the Internet of Things in action can be seen in global logistics companies that install smart IoT sensors inside their delivery trucks. These sensors continuously track important details such as vehicle location, temperature conditions for sensitive goods, fuel usage, and driving patterns in real time. Managers receive instant updates through connected dashboards, which helps them quickly choose faster routes, avoid traffic delays, and ensure that perishable or fragile items remain safe during transportation. Because of this real-time visibility, companies can reduce delivery delays, prevent product damage, and lower fuel and maintenance costs. Ultimately, this smart use of IoT technology improves operational efficiency, reduces expenses, and increases customer satisfaction, proving that IoT delivers real business value beyond just advanced technology.

4.2.8 Artificial Intelligence (AI)

Imagine walking into a smart store where the lights turn on automatically, a friendly voice greets you by name, and a screen suggests products you might like based on what you bought last time. No human is directly controlling these actions, yet the system seems to “understand” you. This smart behaviour is made possible by Artificial Intelligence.

Artificial Intelligence (AI) refers to the ability of machines or computer systems to perform tasks that usually require human intelligence. These tasks include thinking, learning from experience, recognising patterns, understanding language, and solving problems. Instead of simply following fixed instructions, AI systems analyse data and improve their performance over time.

Common examples of AI in everyday life include chatbots that answer customer questions, voice assistants that respond to spoken commands, and recommendation systems that suggest movies, music, or products based on user preferences.

Use case: Amazon

A well-known example of AI in business is Amazon. The company uses AI to recommend products that match a customer’s interests, predict what shoppers might want to buy in the future, and optimize delivery routes to make shipping faster and more efficient. Because of AI, Amazon can provide a more personalised shopping experience while also improving its overall operations.

4.2.8.1 Applications of AI in Business

1. **Customer service and support** : Many companies now use AI-powered chatbots and virtual assistants to answer customer questions at any time of the day. This helps businesses provide quick responses without always needing human staff.
2. **Personalized marketing and recommendations** : AI studies customer behavior, past purchases, and preferences to suggest products or services that people are more likely to buy. This makes marketing more relevant and effective.
3. **Sales forecasting and decision-making** : By analyzing large amounts of data, AI can predict future sales trends and customer demand. Business managers can then make smarter decisions about pricing, inventory, and planning.
4. **Supply chain and logistics management** : AI helps companies track goods, choose faster delivery routes, and manage warehouse operations efficiently. This reduces delays and lowers transportation costs.
5. **Fraud detection and security**: Banks and online businesses use AI to monitor unusual transactions or suspicious activities. When something looks abnormal, the system alerts the company immediately.

4.2.8.2 Advantages of AI in Business

1. **Increased efficiency and productivity** : AI can perform repetitive tasks quickly and accurately, allowing employees to focus on more creative and strategic work.
2. **Better decision-making** : Because AI analyses huge amounts of data in a short time, businesses receive useful insights that help them make informed decisions.
3. **Cost reduction** : Automation reduces the need for manual labour in routine tasks, which helps businesses save operational costs in the long run.
4. **Improved customer experience** : Personalised recommendations, quick responses, and smooth services make customers feel valued and satisfied.
5. **Competitive advantage** : Companies that use AI effectively can innovate faster, understand customers better, and stay ahead of competitors in the market.

4.2.9 Machine Learning (ML)

Think about a child learning to recognise different types of fruits. At first, the child may confuse an apple with a tomato. But after seeing many examples and being corrected several times, the child slowly becomes better at identifying each fruit correctly without needing detailed instructions every time. In a similar way, computers can also “learn” from examples rather than being told every single rule. This learning ability is what we call Machine Learning.



Machine Learning (ML) is a branch or subset of Artificial Intelligence that enables computer systems to learn from data and improve their performance automatically. Instead of being explicitly programmed with fixed rules, ML systems analyse patterns in large amounts of information, make predictions, and become more accurate over time as they receive more data. This makes ML especially useful in situations where patterns are complex or constantly changing.

Common applications of Machine Learning include fraud detection in banking systems, spam filtering in email services, and demand forecasting in businesses to predict future product needs.

Case Study: Netflix and Machine Learning

Background

Netflix began as a DVD rental service but later transformed into one of the world's leading online streaming platforms. As its global audience grew into millions of users, the company faced the challenge of helping viewers quickly find movies and TV shows they would enjoy. With such a vast library of content, simply listing titles was not enough. Netflix needed a smarter way to understand user preferences and deliver a personalised viewing experience.

Problem Statement

The main problem Netflix faced was content overload. Users often spend too much time searching for something to watch, which could lead to frustration and even cancellation of subscriptions. Additionally, different viewers have different tastes, languages, and viewing habits, making it difficult to recommend suitable content using traditional methods. Netflix required a system that could automatically learn from user behaviour and continuously improve recommendations.

Solution

To solve this issue, Netflix adopted Machine Learning algorithms that analyse large amounts of user data. These systems study:

- ◇ What users watch
- ◇ How long they watch
- ◇ What they pause, skip, or rewatch
- ◇ Ratings and search history

Using this information, Machine Learning models identify viewing patterns and predict what each user is most likely to enjoy. The platform then displays personalised recommendations, customised homepages, and even tailored thumbnail images to match individual interests. Over time, the system becomes more accurate as it learns from new data.

Conclusion

Netflix's use of Machine Learning has significantly improved the user experience by making content discovery faster and more relevant. It has also increased customer satisfaction, viewing time, and subscription retention, giving Netflix a strong competitive advantage in the streaming industry. This case clearly shows how Machine Learning can transform business operations by turning data into meaningful, customer-focused decisions.



Recap

- ◇ Artificial Intelligence enables machines to mimic human thinking by learning, recognising patterns, and making decisions automatically.
- ◇ Machine Learning is a subset of AI that improves system performance using data rather than fixed programming rules.
- ◇ Businesses use AI for customer service, marketing, logistics, and fraud detection to enhance efficiency and accuracy.
- ◇ AI improves productivity and reduces operational costs through automation and data-driven insights.
- ◇ Real companies like Amazon and Netflix demonstrate AI and ML success by providing personalized services and smart recommendations.



Objective Questions

1. What does AI stand for?
2. Which technology is a subset of AI?
3. Name one common example of AI in daily life.
4. Which company uses AI for product recommendations?
5. What does ML mainly learn from?
6. Name one use of ML in banking.
7. Which system filters unwanted emails?
8. AI helps improve what type of decision-making?



9. Which ML use predicts future demand?
10. AI automation increases what in organisations?
11. Netflix uses ML for what purpose?
12. AI reduces what type of operational burden?



Answers

1. Artificial Intelligence
2. Machine Learning
3. Voice assistant
4. Amazon
5. Data patterns
6. Fraud detection
7. Spam filter
8. Data-driven
9. Demand forecasting
10. Productivity
11. Recommendations
12. Manual work



Self Assessment Questions

1. Explain the concept of Artificial Intelligence with suitable business examples.
2. Describe Machine Learning and its importance in modern organisations.
3. Discuss the applications of AI in business operations.
4. Differentiate between Artificial Intelligence and Machine Learning.

5. Explain the advantages of AI-based automation for decision-making and productivity.



Assignments

1. Identify three AI-based applications used in your daily life and explain their benefits.
2. Study an online shopping platform and analyse how recommendations are generated.
3. Collect examples of fraud detection or spam filtering and explain the ML role behind them.
4. Prepare a short report on how AI improves logistics or delivery systems.
5. Design a simple flowchart showing the relationship between AI and Machine Learning.



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Suggested Reading

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SREENARAYANAGURU OPEN UNIVERSITY
FOURTH SEMESTER BACHELOR OF BUSINESS ADMINISTRATION
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MODEL QUESTION PAPER SETS





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FOURTH SEMESTER BBA (Honours) EXAMINATION
Skill Enhancement Course - SGB24BB201SE- IT for Business
(FYUGP - BBA)

MODEL QUESTION PAPER- SET- A
2024 - 25 Admission Onwards

Time: 2 Hours

Max Marks: 45

SECTION A

Answer any five questions in a word or sentence. Each question carries one mark
(5×1 = 5 Marks)

1. What is meant by Information Technology?
2. Define data.
3. What does DBMS stand for?
4. Which system records day-to-day business transactions?
5. What is a data warehouse?
6. Which information system supports structured decisions?
7. Name one component of an Information System.
8. What type of knowledge is easily documented and stored?

SECTION B

Answer any five questions in two or three sentences each.
Each question carries two marks.

(5×2 =10 Marks)

9. Distinguish between data and information.
10. State any two functions of a DBMS.
11. What is the role of TPS in organisations?
12. Explain the importance of MIS for middle-level managers.



13. What is meant by what-if analysis in DSS?
14. Mention two features of a data warehouse.
15. State any two components of ICT.
16. How does IT help in the finance function?

SECTION C

Answer any four questions. Each question carries five marks.

(4×5 = 20 Marks)

17. Explain the importance of Information Technology in modern business.
18. Describe the characteristics of Transaction Processing Systems (TPS).
19. Explain the features of Management Information System (MIS).
20. Discuss the functions of a Database Management System.
21. Explain the purpose and features of Data Warehousing.
22. Describe the components of an Information System.

SECTION D

Answer any one questions. Each question carries 10 marks.

(10×1 =10 Marks)

23. Compare TPS, MIS, DSS, and KMS with suitable examples.
24. Explain the role of IT in different functional areas of business with examples.





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MODEL QUESTION PAPER- SET- B
2024 - 25 Admission Onwards

Time: 2 Hours

Max Marks: 45

SECTION A

Answer any five questions in a word or sentence. Each question carries one mark
(5×1 = 5 Marks)

1. What is a database?
2. Define Information System.
3. Expand DSS.
4. Who are the primary users of TPS?
5. What is tacit knowledge?
6. Which system provides periodic reports?
7. Name one example of DBMS software.
8. Which system supports long-term strategic analysis?

SECTION B

Answer any five questions in two or three sentences each.
Each question carries two marks.

(5×2 =10 Marks)

9. State any two differences between database and data warehouse.
10. Explain the concept of MIS.
11. What are the key characteristics of TPS?
12. Mention two advantages of IT in communication.



13. What is Knowledge Management System?
14. State any two functions of MIS.
15. How does IT help in cost reduction?
16. What is meant by semi-structured decision?

SECTION C

Answer any four questions. Each question carries five marks.

(4×5 = 20 Marks)

17. Differentiate between data and information with examples.
18. Explain the components of an Information System in detail.
19. Describe the role and importance of DBMS in organisations.
20. Discuss the features and applications of Decision Support Systems.
21. Explain the importance of Knowledge Management Systems with examples.
22. Describe the role of IT in production and operations management.

SECTION D

Answer any one questions. Each question carries 10 marks.

(10×1 =10 Marks)

23. Analyse the role of MIS in improving organisational performance with a case example.
24. Explain Transaction Processing Systems and illustrate with the example of banking or railway reservation system.



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**DON'T LET IT
BE TOO LATE**

**SAY
NO
TO
DRUGS**

**LOVE YOURSELF
AND ALWAYS BE
HEALTHY**



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