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# **Data Science for Managerial Decisions (MB 511)**

## **Introduction to Data Science**

**Instructor**  
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# Data Science for Managerial Decisions (MB 511)

## Program Overview

- Introduction to Data Science
- Information Technology: An Overview
- Applications of Data Science in various fields
- MIS and Control Systems
- Data Collection and Data Pre-Processing
- Building Information Systems
- Support Systems for Management Decisions



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### References/Literature

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- MIS: Management Perspective, D.P. Goyal, Macmillan Business Books.

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## Online Resources



## Software Resources



# Information Technology: An Overview

- Foundations of Information Technology
- Information Systems and Management
- Cybersecurity and IT Governance
- Future Trends in Information Technology



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# Information Technology: An Overview

## Foundations of Information Technology



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Information Technology (IT) in a management perspective refers to the use of technology to **organize, process, store, retrieve, and transmit information** within an organization. It encompasses a broad range of **tools, systems, and applications** designed to facilitate effective **communication, streamline business processes, and support decision-making** at various levels of management.

In a management context, IT serves as a crucial enabler, **providing the infrastructure** and tools necessary for **efficient operations**. It involves **hardware components** like computers, servers, and networking devices, as well as **software applications** that aid in data analysis, project management, and communication. The integration of IT into management practices has transformed the way business operate, enhancing their ability to adapt to changing environments and stay competitive.

# Information Technology: An Overview

## Foundations of Information Technology



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Key aspects of the definition of Information Technology in a management perspective include:

**Information Management:** IT involves the systematic handling of information, including its collection, storage, retrieval, and dissemination. This supports managerial decision-making by providing timely and accurate data.

**Automation of Processes:** IT helps automate routine tasks and business processes, reducing manual efforts and improving efficiency.

This allows management to focus on strategic initiatives rather than routine operational tasks.

**Communication and Collaboration:** Information Technology facilitates seamless communication within and outside the organization.

Email, video conferencing, and collaborative platforms enhance teamwork and information sharing among different levels of management.

**Decision Support Systems:** IT systems provide decision-makers with tools for data analysis and reporting. This empowers management to make informed and data-driven decisions, leading to more effective strategic planning.

**Security and Risk Management:** In the context of management, IT plays a crucial role in ensuring the security of sensitive information. It involves implementing measures to protect data from unauthorized access, ensuring compliance with regulations, and managing cybersecurity risks.

# Information Technology: An Overview

## Historical context and evolution



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1. **Early Computing Machines (Pre-20th century)**: The roots of IT can be traced back to early mechanical devices like the abacus and the Jacquard loom, which utilized punch cards for automated textile pattern weaving. However, it was Charles Babbage's design for the Analytical Engine in the 19th century that laid the conceptual groundwork for modern computing.
2. **Mechanical and Electromechanical Computers (1930s-1940s)**: The 1930s and 1940s saw the development of mechanical and electromechanical computers, such as Konrad Zuse's Z3 in Germany and the Harvard Mark I in the United States. These machines were the precursors to electronic computers, employing gears, levers, and relays to perform calculations.
3. **Electronic Computers (1940s-1950s)**: The invention of the electronic computer marked a turning point. The ENIAC (Electronic Numerical Integrator and Computer), completed in 1945, is considered the first general-purpose electronic computer. Subsequent developments led to the creation of stored-program computers, with the UNIVAC I becoming the first commercially produced computer in 1951.





# Information Technology: An Overview

## Historical context and evolution

4. **Mainframe Era (1950s-1970s)**: Mainframe computers dominated the computing landscape during this era. They were large, powerful machines designed for centralized computing and data processing. IBM played a pivotal role in the mainframe era, introducing systems like the IBM System/360, which set standards for compatibility across different models.
5. **Personal Computer Revolution (1970s-1980s)**: The advent of microprocessors and the development of personal computers (PCs) marked a shift towards decentralized computing. Companies like Apple and Microsoft emerged, and the IBM PC, introduced in 1981, became a standard. This era democratized computing, making it accessible to individuals and small businesses.
6. **Networking and the Internet (1980s-1990s)**: The development of computer networks and protocols, such as TCP/IP, led to the creation of the Internet. This interconnected global network revolutionized communication and information exchange. The World Wide Web (WWW), introduced in the early 1990s, further accelerated the accessibility of information.



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# Information Technology: An Overview

## Historical context and evolution



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7. **Mobile Computing and Connectivity (2000s-Present)**: The 21st century witnessed the proliferation of mobile devices and wireless connectivity. Smartphones and tablets became ubiquitous, enabling users to access information and applications on the go. Cloud computing emerged as a dominant paradigm, providing scalable and flexible computing resources.

8. **Big Data, Analytics, and Artificial Intelligence (2010s-Present)**: The increasing volume of data led to a focus on Big Data analytics, with technologies like Hadoop and Spark enabling the processing of massive datasets. Artificial Intelligence (AI) and machine learning gained prominence, revolutionizing data analysis, automation, and decision-making.



# Information Technology: An Overview

## Key Components of Information Technology



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### Hardware:

**Computers:** The foundation of IT, computers range from personal devices like laptops and desktops to powerful servers that manage and process organizational data.

**Networking Equipment:** Includes routers, switches, and other devices that enable communication and data transfer between computers and systems within an organization.

### Software:

**Operating Systems:** Fundamental software that manages computer hardware and provides services for computer programs.

**Applications:** Specific software applications tailored to support various management functions, such as project management tools, customer relationship management (CRM) systems, and enterprise resource planning (ERP) software.

### Data and Databases:

**Databases:** Systems for storing, organizing, and retrieving data. Relational databases and NoSQL databases are commonly used to manage structured and unstructured data.

**Data Warehousing:** Centralized repositories that consolidate and store data from various sources, providing a unified view for reporting and analysis.

# Information Technology: An Overview

## Key Components of Information Technology



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### Networking and Communication:

**Internet and Intranet:** Enable global connectivity and internal communication within an organization.

**Communication Protocols:** Standards that govern data transmission, such as TCP/IP, ensuring seamless communication between devices.

### Cybersecurity:

**Firewalls and Security Software:** Protect the organization's network by monitoring and controlling incoming and outgoing network traffic.

**Encryption:** Safeguards sensitive data by converting it into a code that can only be deciphered by authorized parties.

**Access Controls:** Restricting access to information based on user roles and permissions to ensure data security.

### Cloud Computing:

Infrastructure as a Service (**IaaS**), Platform as a Service (**PaaS**), and Software as a Service (**SaaS**): Cloud computing models that offer scalable computing resources, platforms, and software over the internet, reducing the need for physical infrastructure.

# Information Technology: An Overview

## Key Components of Information Technology



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### IT Services and Support:

**Help Desk Services:** Provide assistance and support for IT-related issues to ensure smooth operations.

**IT Consulting:** Involves expert guidance on technology strategy, implementation, and optimization to align with organizational goals.

### Emerging Technologies:

**Artificial Intelligence (AI) and Machine Learning (ML):** Enhance decision-making processes and automate tasks by leveraging algorithms and data analysis.

**Internet of Things (IoT):** Connects physical devices to the internet, enabling data collection and automation in various contexts, from manufacturing to logistics.

### Strategic Planning and Governance:

**IT Governance:** Frameworks and processes to ensure that IT aligns with organizational strategies and complies with regulations.

**Strategic Planning:** Involves the development of IT strategies that support organizational goals and growth.

# Information Technology: An Overview

## Overview of databases and data management

A database is a **structured collection** of data organized in a way that allows for **efficient storage, retrieval, and management of information**. It serves as a **central repository** for storing and managing data in a systematic and structured manner. Databases are fundamental components in information systems and are widely used in various applications, ranging from business operations to scientific research.

### Database Types:

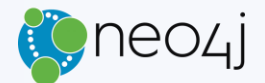
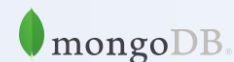
**Relational Databases (RDBMS):** Organize data into tables with predefined relationships between them. Examples include MySQL, PostgreSQL, and Microsoft SQL Server.

**NoSQL Databases:** Designed to handle unstructured or semi-structured data and offer flexible schemas. Examples include MongoDB (document-oriented) and Cassandra (wide-column store).

**Graph Databases:** Specifically designed to represent and query data in the form of a graph, with nodes and edges representing entities and relationships. Examples include Neo4j.



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# Information Technology: An Overview

## Introduction to cloud computing



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Cloud computing is a revolutionary paradigm in the field of information technology that has transformed the way individuals and organizations access, store, and process data. At its core, cloud computing refers to the delivery of computing services over the internet, providing users with on-demand access to a wide range of resources without the need for direct management or ownership of physical infrastructure.

### Types of Cloud Services :

#### Public Cloud:

**Definition:** In a public cloud, cloud services are provided by third-party service providers over the internet. These services are made available to the general public, and multiple organizations or users can share the same infrastructure.

**Advantages:** Cost-effective, scalable, and easy to access. Users don't need to invest in or manage their own infrastructure.

#### Private Cloud:

**Definition:** A private cloud is operated solely for a single organization. It may be managed internally or by a third-party provider. The infrastructure is dedicated to the organization, offering greater control and customization.

**Advantages:** Enhanced security, control, and customization. Ideal for organizations with specific compliance or data privacy requirements.



# Information Technology: An Overview

## Introduction to cloud computing

### Types of Cloud Services :

#### Hybrid Cloud:

**Definition:** Hybrid cloud combines elements of both public and private clouds. It allows data and applications to be shared between them, offering greater flexibility. Organizations can use public cloud resources for non-sensitive functions and maintain critical workloads in a private cloud.

**Advantages:** Balances the benefits of both public and private clouds, providing flexibility, scalability, and the ability to meet specific security and compliance needs.

#### Multi-Cloud:

**Definition:** Multi-cloud involves using services from multiple cloud providers. Organizations may choose different cloud providers for different services or applications, avoiding vendor lock-in and optimizing for specific features.

**Advantages:** Redundancy, flexibility, and the ability to leverage the strengths of different cloud providers for various use cases.



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# Information Technology: An Overview

## Introduction to cloud computing

Key components and characteristics of cloud computing include:

**On-Demand Self-Service:** Users can provision and manage computing resources, such as server instances, storage, and applications, as needed without requiring human intervention from service providers.

**Broad Network Access:** Cloud services are accessible over the internet from a variety of devices, including laptops, smartphones, and tablets. This accessibility ensures that users can connect to cloud resources from virtually anywhere.

**Resource Pooling:** Cloud providers pool computing resources to serve multiple customers. Resources, such as storage and processing power, are dynamically assigned and reassigned based on demand, optimizing efficiency.

**Rapid Elasticity:** Cloud resources can be quickly scaled up or down to accommodate changes in demand. This elasticity allows users to scale resources seamlessly, ensuring optimal performance and cost-effectiveness.

**Measured Service:** Cloud computing resources are metered, and users are billed based on their actual usage. This pay-as-you-go model provides cost efficiency, as users only pay for the resources they consume.



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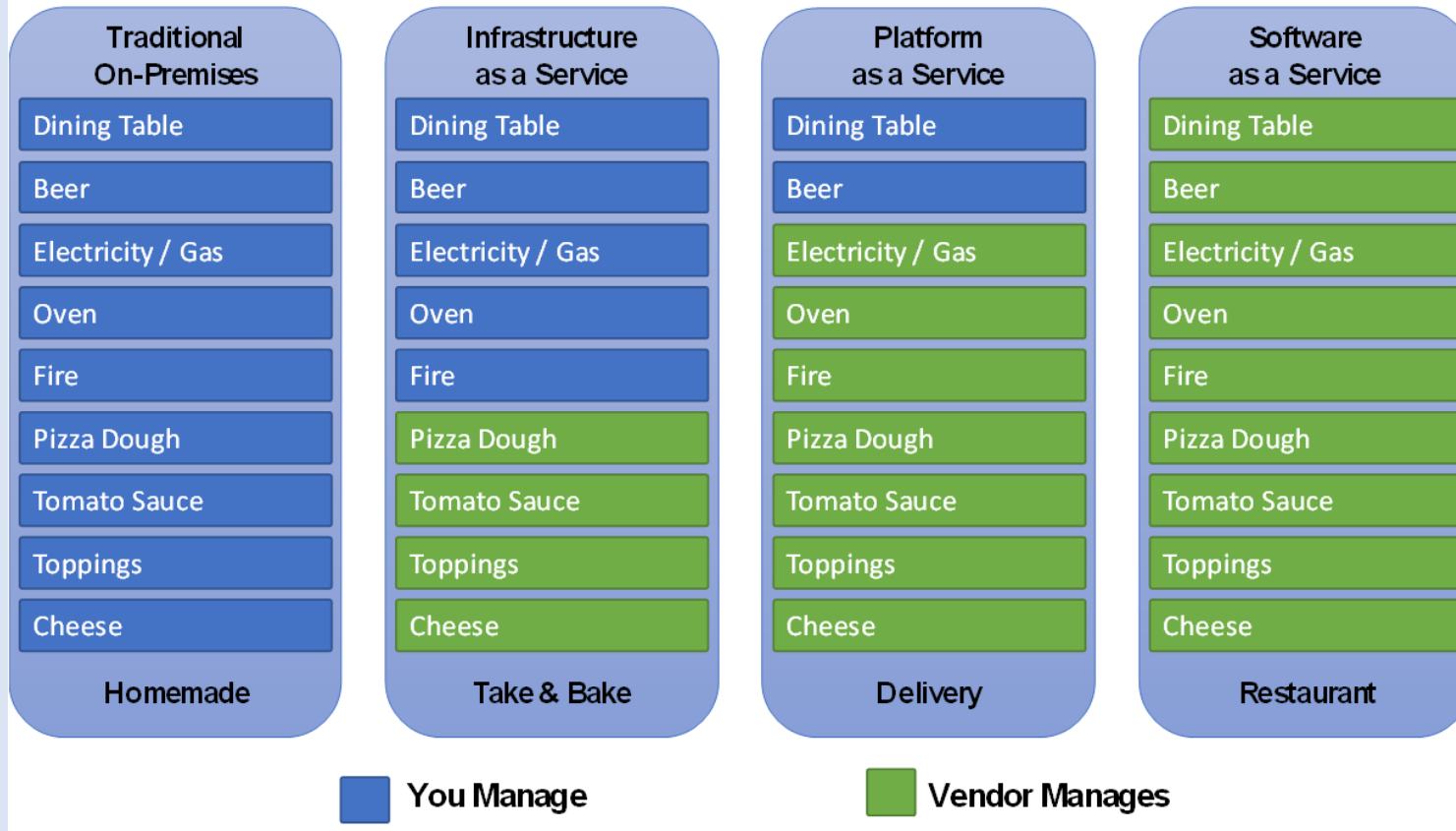
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## Introduction to cloud computing – Service Models



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### Pizza as a Service



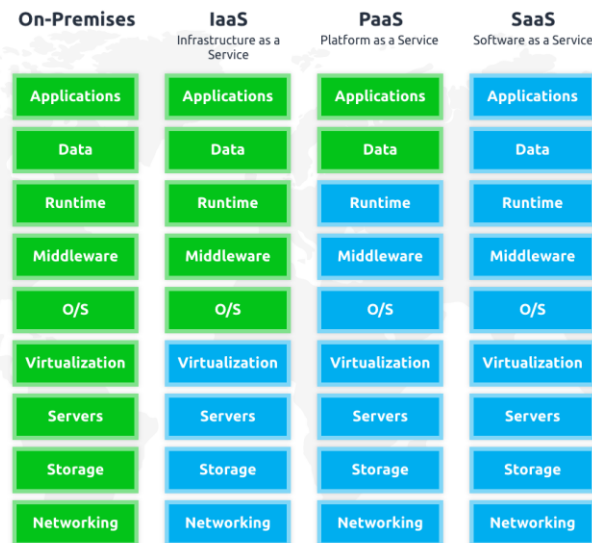
# Information Technology: An Overview

## Introduction to cloud computing – Service Models



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### Cloud Computing Models



aws partner network

veeam CSP PARTNER Gold

VMWARE CLOUD VERIFIED

You Manage

Provider Manages

1. **On-Premise:** All components are managed by the business.

2. **Infrastructure as a Service (IaaS):** Provides virtualized computing resources over the internet. Users can rent virtual machines, storage, and networking components.

3. **Platform as a Service (PaaS):** Offers a platform that includes infrastructure and tools to develop, test, and deploy applications. Users can focus on application development without managing the underlying infrastructure.

4. **Software as a Service (SaaS):** Delivers software applications over the internet, eliminating the need for users to install, maintain, and update software locally.

# Information Technology: An Overview

## Introduction to cloud computing

### Your Cloud Journey:

#### AI Engineer

AZ900 >> DP900 >> AI900 >> AI100 >> AI101

#### Data Analyst

AZ900 >> DP900 >> AI900 >> PL300 >> DA100 >> 70-778 >> 70-779

#### Data Engineer

AZ900 >> DP900 >> AI900 >> DP201 >> DP203 >> DP420

#### Data Scientist

AZ900 >> DP900 >> AI900 >> DP100



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# Information Technology: An Overview

## Information Systems and Management

### What are information systems:

Information Systems (IS) in business refer to the organized, coordinated, and integrated systems that collect, process, store, and distribute information within an organization. These systems play a crucial role in supporting business operations, decision-making processes, and strategic planning. Information Systems in business can be categorized into various types, each serving specific functions.

### What is importance information systems:

The importance of information systems in various aspects of modern life and business cannot be overstated. Some key aspects include:

- Enhanced Decision-Making
- Improved Efficiency
- Increased Productivity
- Strategic Planning
- Competitive Advantage
- Customer Relationship Management (CRM)
- Global Connectivity:
- Risk Management
- Innovation and Adaptability
- Compliance and Security



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# Information Technology: An Overview

## Information Systems and Management

### Examples of information systems:

- **Transaction Processing Systems (TPS):** Record and process day-to-day transactions, supporting routine business operations.
- **Management Information Systems (MIS):** Provide summarized, structured data for middle management to facilitate decision-making.
- **Decision Support Systems (DSS):** Assist in complex decision-making by providing analytical tools and interactive capabilities.
- **Executive Information Systems (EIS):** Offer top-level executives strategic information for long-term planning and decision-making.
- **Enterprise Resource Planning (ERP):** Integrate and manage various business processes and functions across an organization.
- **Supply Chain Management Systems (SCM):** Manage the flow of goods, services, and information throughout the supply chain.
- **Customer Relationship Management (CRM):** Focus on managing interactions with customers to enhance relationships and satisfaction.
- **Knowledge Management Systems (KMS):** Capture, organize, and disseminate organizational knowledge to improve decision-making.
- **Business Intelligence Systems (BI):** Collect, analyze, and present business data to support informed decision-making.
- **Collaboration Systems:** Facilitate communication and collaboration among individuals and teams within an organization.



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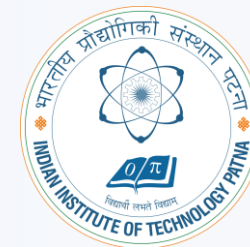
## Quiz and Assignment

Dear Class your first quiz and assignment will be due as per following schedule.

- **Quiz** February 24, 2024 (10 AM – 10:30 AM) – Link will be updated soon
- **Assignment** February 25, 2024 (12:00 AM) – March 2, 2024 (11:59 PM) – [Link](#)



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**Have a question?**

**Feel Free to Reach out at**

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