1. How IT Impacts Organizations

Information Technology (IT) has a significant impact on organizations by changing management structures, altering job roles, and shaping the work environment[1111].

- **Reduction of Middle Managers**: IT systems automate many routine tasks like preparing reports or monitoring inventory, which were previously handled by middle managers[2]. For instance, where a manager once manually tracked employee attendance, payroll software now generates these reports automatically[3]. This reduces the need for managers to handle repetitive tasks, leading to a flatter organizational hierarchy[4444].

- **Changing the Manager's Job**: With routine tasks automated, managers can spend less time on paperwork and more on strategic thinking, planning, and problem-solving[5]. IT provides real-time data and dashboards, enabling faster and more accurate decisions[6]. A sales manager, for example, can view live sales trends instead of waiting for monthly reports[7].

- **Job Concerns for Employees**: IT and automation can lead to job loss as machines and software replace human roles[8]. For example, bank tellers have been replaced by ATMs[9]. However, IT also creates new job opportunities in fields like data analysis, cybersecurity, and AI engineering[10101010].

- **Work Environment and Employees**: The work environment is also affected. Long hours on computers can cause health issues like eye strain and stress[11]. At the same time, IT enables remote work, offering flexibility [12], and provides accessibility tools, such as screen readers, to help employees with disabilities work effectively[13131313].

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2. Importance of Information Systems to Security

Information security is crucial for protecting information systems from a variety of threats. Its primary goal is to ensure the

Confidentiality, **Integrity**, and **Availability** of data, often called the "CIA Triad"[14141414].

- **Confidentiality**: To prevent unauthorized access to information[15].

- **Integrity**: To ensure the accuracy and reliability of data[16].

- **Availability**: To ensure that systems and data are accessible when needed[17].

Information systems face several threats[18]:

- **Human Threats**: These include insider threats from employees who misuse data, social engineering tactics like phishing, and simple negligence such as using weak passwords[19].
- **Technical Threats**: These involve malware (viruses, ransomware), hacking, Denial of Service (DoS) attacks that overload systems, and zero-day exploits that target unpatched vulnerabilities[20].
- **Natural Threats**: Events like fires, floods, or earthquakes can damage IT infrastructure[21].

To counter these threats, security controls are implemented[22]:

- **Preventive Controls**: These aim to stop attacks before they happen and include firewalls, strong authentication (like MFA), and employee security training[23].
- **Detective Controls**: These identify an attack as it occurs, using tools like Intrusion Detection Systems (IDS) and security audits[24].
- **Corrective Controls**: These are used to respond and recover after an attack, involving backup and disaster recovery plans, incident response teams, and patching vulnerabilities[25]. For example, to counter a ransomware attack, an organization would rely on regular backups and endpoint protection[26].

3. Why We Should Study Information Systems

Studying Information Systems (IS) is important because they have high strategic value for organizations and a profound impact on society[27272727].

IS are complex and expensive to acquire, operate, and maintain, and they are constantly evolving with technology[28282828]. Understanding them is critical for modern business and daily life.

The importance of IS to society includes:

- **Improves Quality of Life**: IS provides convenient access to services like online banking, e-learning, and entertainment anytime and anywhere, reducing barriers of distance and time[292929292929292929].

- **Part of the "Robot Revolution"**: IS is the foundation for automation, AI, and robotics, which are automating routine tasks in factories, offices, and homes[30]. This increases productivity and efficiency[31].

- **Advances in Healthcare**: IS enables telemedicine for remote consultations, Electronic Health Records (EHRs) for better care coordination, and AI for advanced diagnostics and treatment[32].

By studying IS, we can better understand how to manage these powerful tools to achieve competitive advantage, improve our lives, and navigate their societal impacts[33333333].

4. Overview of Computer-Based Information Systems (CBIS)

A Computer-Based Information System (CBIS) is a system that uses technology to process raw facts (**data**) into meaningful context (**information**), which can then be used to gain insights (**knowledge**)[34343434]. A CBIS is composed of six main parts:

Hardware, **Software**, **Database**, **Network**, **Procedures**, and **People**[35].

CBIS can be categorized based on the breadth of their support and the employees they support[36]:

A. Breadth of Support for Information Systems

- **Functional Area Information Systems (FAIS)**: Supports a single department, like an HR system for payroll[38383838].

- **Enterprise Resource Planning (ERP)**: Integrates all departments into one system with a shared database, such as SAP or Oracle[39393939].

- **Transaction Processing Systems (TPS)**: Handles routine, day-to-day operational tasks like ATM transactions or billing at a supermarket[40404040404040404040].
- **Interorganizational Information Systems (IOS)**: Connects two or more organizations, like Amazon with its suppliers and customers[41414141].

B. Support for Organizational Employees

- **Knowledge Workers Systems (KWS)**: Helps professionals who create or use knowledge, such as architects using design tools[43434343].
- **Office Automation Systems (OAS)**: Makes office work easier and includes tools like MS Office or Google Workspace[44444444].
- **Business Intelligence (BI) Systems**: Helps managers make better decisions using data analysis tools[45].
- **Expert Systems (ES)**: Mimics a human expert in a specific field, like a medical diagnosis system[46].
- **Dashboards**: Show important information at a glance, such as a sales dashboard with KPIs and trends[47].

5. The Database Approach and Big Data

The Database Approach

The Database Approach is a method of managing data where information is systematically organized and accessed using a **Database Management System (DBMS)**[48]. This method is designed to improve efficiency and ensure data is reliable[49]. The primary goals are:

- **To Minimize**:
  - **Data Redundancy**: Avoids storing the same data in multiple places[50]. For example, a customer's address is stored once instead of in many different files[51].
  - **Data Isolation**: Eliminates difficulty in accessing data that is stored in separate applications[52].

    - **Data Inconsistency**: Prevents having different values for the same data point[53]. For instance, if an employee's salary is updated in one file but not another, an inconsistency arises[54].

- **To Maximize**:
    - **Data Security**: Protects data from unauthorized access, such as using role-based access so only HR can view salaries[55555555].
    - **Data Integrity**: Maintains the accuracy and reliability of data[56]. An example is a rule that an employee's age cannot be a negative number[57].
    - **Data Independence**: Separates data from the applications that use it, so applications can be updated without affecting the database structure[58].

Big Data

Big Data refers to extremely large, complex, and diverse datasets that are too big to be managed or analyzed by traditional data management tools[59595959]. It is defined by three key characteristics, known as the **3Vs**:

1. **Volume**: Refers to the massive size of the datasets, such as petabytes of social media posts or transaction logs[60606060].
2. **Velocity**: Refers to the high speed at which new data is generated and must be processed, like stock market data or real-time fraud detection streams[616161616161616161].
3. **Variety**: Refers to the different formats of data, which can be **structured** (like in relational databases), **unstructured** (videos, images, social media posts), or **semi-structured** (XML or JSON files)[62626262].

6. Data Warehouses and Data Marts (and their Differentiation)

Data warehouses and data marts are essential components for managing large volumes of data and turning them into insights for business intelligence and decision-making[636363].

Data Warehouse

A **Data Warehouse** is a large, centralized repository designed for business intelligence and decision support[64646464]. Its key characteristics are:

- **Integrated**: Data is consolidated from multiple sources (like operational systems) and made consistent[65].
- **Time-variant**: Data is organized along time dimensions (e.g., daily, monthly), which enables trend analysis[66666666].
- **Nonvolatile**: Once data is entered, it is not updated or deleted, providing a stable historical record[67].
- **Multidimensional**: Data is structured to support analysis from multiple dimensions (e.g., sales by product, region, and year) using Online Analytical Processing (OLAP)[68686868].

Data Mart

A **Data Mart** is a smaller, more focused version of a data warehouse that is designed for a specific business unit or function, such as marketing, finance, or HR[69696969]. It provides faster, targeted access to data for departmental needs and is often fed from the central data warehouse[70].

Differentiating a Data Warehouse from a Data Mart

The main differences between a data warehouse and a data mart are summarized below[71]:

Feature	Data Warehouse	Data Mart
Scope	Enterprise-wide	Department-specific
Size	Very large (TBs-PBs)	Smaller (GBs-TBs)
Users	Top management, analysts, enterprise-wide	Departmental managers, specific teams
Data Source	Multiple enterprise systems	Usually fed from the data warehouse

Complexity	High (enterprise integration)	Lower (focused)
Purpose	Strategic decision-making	Tactical/departmental decision-making

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7. Managing Data

Organizations face several significant challenges in managing their data resources effectively[72].

Difficulties of Managing Data Resources

- **Explosive Growth of Data**: Data increases exponentially over time from transactional, operational, social, and sensor-based sources[73].
- **Data Scattered Across Sources**: Data often resides in fragmented locations, including internal systems, personal files, and cloud storage, making integration difficult[74].
- **Emergence of New Data Sources**: New sources like social media, IoT devices, and clickstream data introduce variety and complexity[75].
- **Data Degradation & Data Rot**: Over time, data can lose relevance or accuracy, such as when customer contact details become outdated[76].
- **Security, Quality & Integrity Risks**: Organizations must protect data from unauthorized access, hacking, and corruption[77].
- **Changing Legal & Regulatory Requirements**: Compliance with data protection laws like GDPR requires constant updates and monitoring[78].

Solutions for Managing Data

To overcome these challenges, organizations establish an **information policy** within a **Data Governance** framework[79]. Data governance ensures accountability and control over enterprise data, often involving **Master Data Management (MDM)** to maintain a consistent, single source of truth for key data like customer or product details[80].

8. Knowledge Management

Knowledge management is the process by which organizations transform raw data into actionable insights to support decision-making[8181818181818181]. It begins with the data hierarchy: raw **data** is processed to create meaningful **information**, and insights gained from that information become **knowledge**[82828282].

Information systems are the core of knowledge management. The process involves:

1. **Integrating Information Silos**: Bringing together fragmented data from different sources into a unified environment, often by building data warehouses[83].

2. **Analysis and Sense-Making**: Applying advanced analytics, AI, and machine learning to extract hidden patterns, insights, and opportunities from the integrated data[84848484].

Key technologies used in knowledge management include NoSQL databases for unstructured data, data warehousing for business intelligence, and BI tools like OLAP and data mining to analyze the data and generate knowledge[858585858585858585].

9. Ethics in the Corporate Environment

To address ethical issues in a corporate environment, especially those related to information systems, organizations can use several ethical frameworks[86]. These frameworks guide decision-making by providing a structured approach to evaluating actions.

The main ethical frameworks are:

- **Utilitarian Approach**: Aims to maximize overall benefits and minimize harm[87].

- **Rights Approach**: Focuses on respecting fundamental human rights, such as privacy and freedom[88].

- **Fairness/Justice Approach**: Ensures that actions result in fair treatment and equal access for all individuals[89].

- **Common Good Approach**: Prioritizes actions that contribute to the well-being of the entire community or society[90].
- **Virtue Ethics**: Emphasizes moral character and virtues like honesty, integrity, and responsibility[91].

A general five-step framework for making ethical decisions is:

1. **Recognize the issue**[92].
2. **Get the facts**[93].
3. **Evaluate alternatives**[94].
4. **Decide and test the decision**[95].
5. **Act and reflect on the outcome**[96].

10. Ethics and Information Technology

Information technology introduces several key ethical issues that organizations and individuals must navigate[97]. These issues revolve around how information is collected, used, and accessed.

- **Privacy**: This concerns the collection, storage, and sharing of personal data[98]. An example is the unauthorized sale of user data by a social media platform[99].
- **Accuracy**: This is about ensuring that information stored in systems is correct and reliable[100]. For example, incorrect medical records could lead to the wrong treatment[101].
- **Property Rights**: This relates to the intellectual property rights of digital content[102]. Downloading cracked software or pirated movies is a common example of infringement[103].
- **Accessibility**: This addresses the question of who has the right to access information and technology[104]. The digital divide, which is the gap between those with and without access to technology, is a major issue here[105].

- **Accountability and Responsibility**: This involves determining who is responsible when an information system causes harm[106]. For instance, if an AI system unfairly rejects a loan application, it is difficult to determine if the developer, user, or company is at fault[107].

11. Decision-Making

Information systems, particularly **Business Intelligence (BI) systems**, play a crucial role in helping organizations make informed decisions by transforming raw data into meaningful insights[108108108108].

BI enables better decision-making through two main functions:

1. Data Analytics Applications

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These applications process data to uncover insights and patterns.

- **OLAP (Online Analytical Processing)**: Allows users to analyze data from multiple dimensions, such as viewing sales by region, product, and time[110].

- **Data Mining**: Finds hidden patterns and relationships in large datasets for the purpose of prediction (forecasting trends) or discovery (finding new patterns)[111].

- **Decision Support Systems (DSS)**: Provides managers with tools for "what-if" analysis, sensitivity testing, and goal-seeking to evaluate different scenarios and make better decisions[112].

2. Presenting Results

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Once data is analyzed, BI tools present the findings in a way that managers can easily understand and act upon.

- **Dashboards**: Provide a visual, at-a-glance snapshot of key performance indicators (KPIs) and other important metrics[114]. They often include features like drill-down capabilities to see details behind summary data[115].

- **Data Visualization**: Converts complex data into easily understandable graphs, charts, and maps[116].