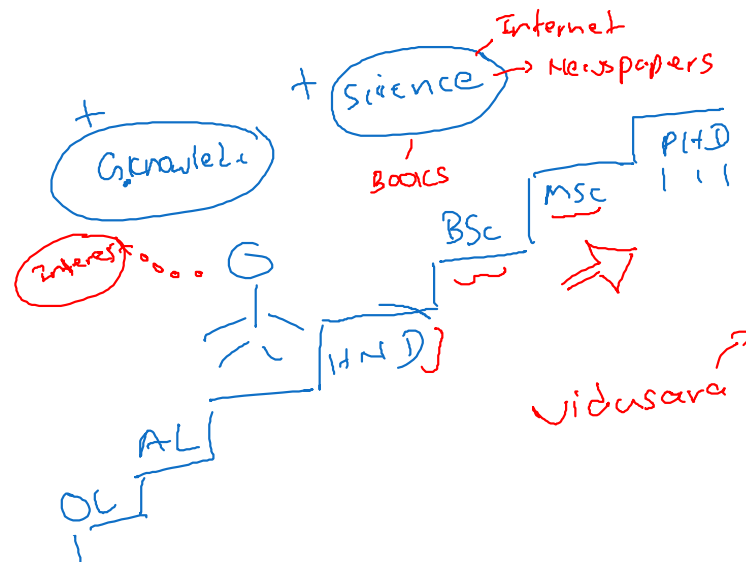# HNDIT1042 Information Management and Information Systems

Advanced Technological Institute

1.5 Timetable allocation (per week)

- Lectures : 3 hours
- Tutorials /practicals : 2 hours
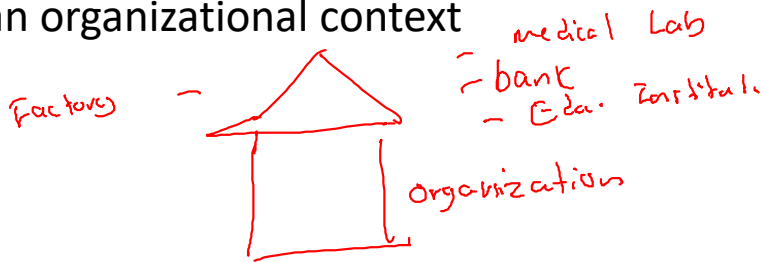- Student activities : 8 hours
- Notional hours :13 hours

Assignment plan

On-line quizzes 20%

Group Assignment 20%
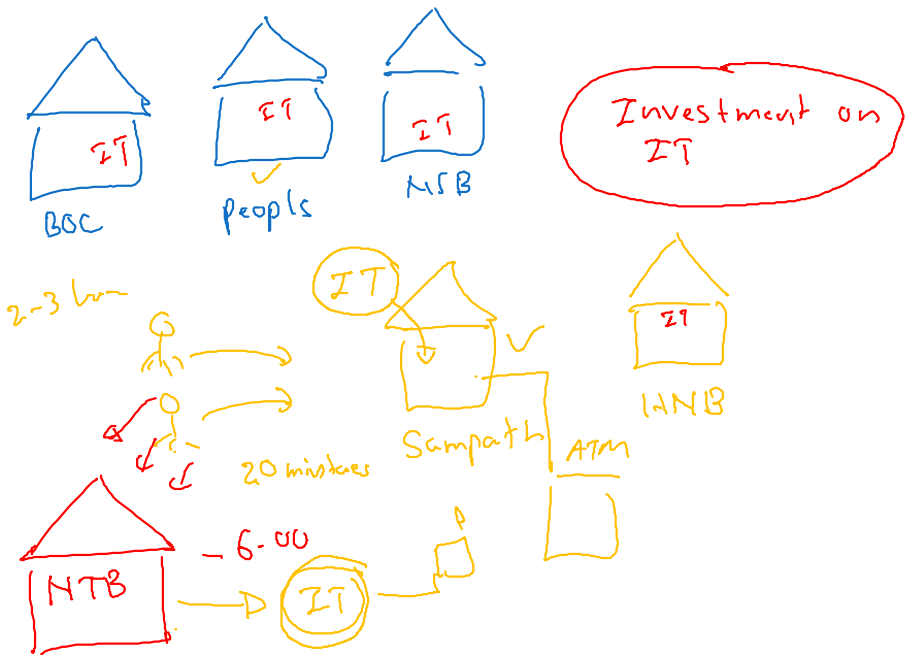
Final Examination (03 hour paper) 60%

Total 100%

Course Aims

- To develop an awareness of the nature and use of information and information systems in an organizational context

(handwritten notes: Factors — ; medical Lab; bank; Edu. Institute; Organization)

Learning Outcomes (LO)

- After successful completion of this course the student should be able to:
- LO1: Explain systems and management concepts and their relevance for information systems
- LO2: Understand the importance and the need for professionalism in managing computer-based systems
- LO3: Explain the strategic use of information technology and the effect of advances in telecommunications and other equipment
- LO4: Discuss the need for special types of MIS and describe their components
- LO5: Describe the issues of planning the development of computer-based applications
- LO6: Understand the need for control and maintenance of information systems
- LO7: Understand the importance of managing remote and network services
- LO8: Examine the operational issues concerned with the management of information system

(handwritten diagram notes: IT, BOC, People, MSB, Investment on IT, 2–3 km, IT, HNB, Sampath, ATM, 20 minutes, 6.00, NTB, IT)

Learning Activities

| Session	Lesson topic	Tutorials/Practical
Week 01	introduction to Information systems	Define data, Information, System, Information systems. Qualities of information Classifications of information

WEEK1

INTRODUCTION TO INFORMATION SYSTEMS

Perspectives on Information Systems

- Information vs. data
  - Data are streams of raw facts.
  - Information is data shaped into meaningf

- Information system:
  - Set of interrelated components
  - Collect, process, store, and distribute information
  - Support decision making, coordination, and control

Data

Input → Process → Output

raw rice → cook → rice
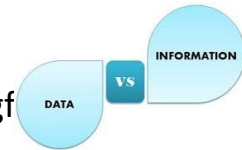
- What is Data?
  - Raw facts
  - Meaningless
    - Ex: Student Name, Exam marks, Exam status

Student name	Exam marks	Exam status
Kamal	80	pass
Dinesh	45	fail
Nirosha	70	pass
Hiran	55	pass
Dilini	76	pass
Gayan	48	fail

Information

Data → [process] → output

- What is information?
  - Processed data in to a meaningful form
  - Valuable than data
  - Used in decision making
    - Ex: -Students name in alphabetical order
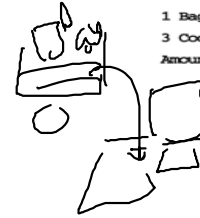   -Students who have passed the exam

Student name	Exam marks	Exam status
Dilini	76	pass
Hiran	55	pass
Kamal	80	pass
Nirosha	70	pass

Data , Info

Data

→ 5 marks

Fruit juice

OO
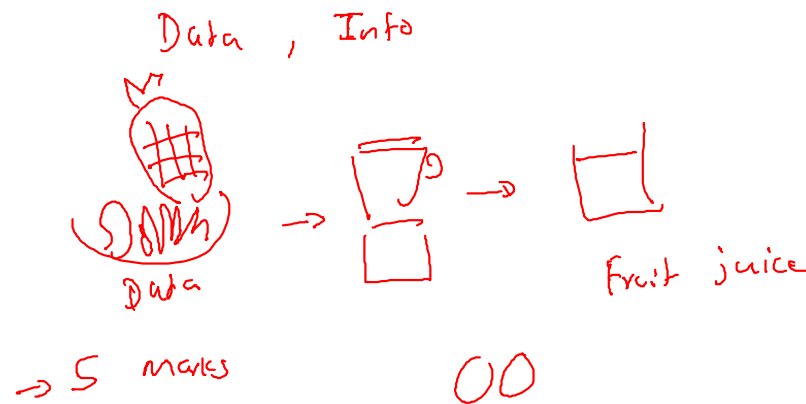
DATA

2 Medium Sodas	$1.49	each
1 Small Turkey Sub	$3.49	each
1 Caesar Salad	$4.49	each
1 Bag of Chips	$0.99	each
3 Cookies	$0.39	each
Amount Received	$20.00	

2 × 1.49 → 2.98

PROCESSES
- Computes each item's total price by multiplying the quantity ordered by the item price (i.e., 2 * 1.49 = 2.98).
- Organizes data.
- Sums all item total prices to determine order total due from customer (13.12).
- Calculates change due to customer by subtracting the order total from amount received (20.00 - 13.12 = 6.88).

INFORMATION

Arrow Deli
10 Park Street
Maple River, DE 20393
(734) 555-2939

QTY	ITEM	TOTAL
2	Medium Sodas	2.98
1	Small Turkey Sub	3.49
1	Caesar Salad	4.49
1	Bag of Chips	0.99
3	Cookies	1.17
	Total Due	13.12
	Amount Received	20.00
	Change	6.88

Thank You!

FIGURE 1.3 DATA AND INFORMATION

Data

Information

Information System

331 Brite Dish Soap 1.29
863 BL Hill Coffee 4.69
173 Meow Cat .79
331 Brite Dish Soap 1.29
663 Country Ham 3.29
524 Fiery Mustard 1.49
113 Ginger Root .85
331 Brite Dish Soap 1.29

331

Sales Region: Northwest
Store: Superstore #122

ITEM NO.	DESCRIPTION	UNITS SOLD
331	Brite Dish Soap	7,156

YTD SALES
$9,231.24

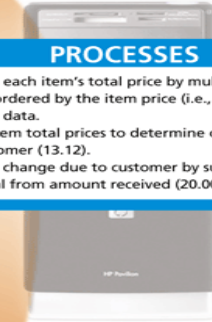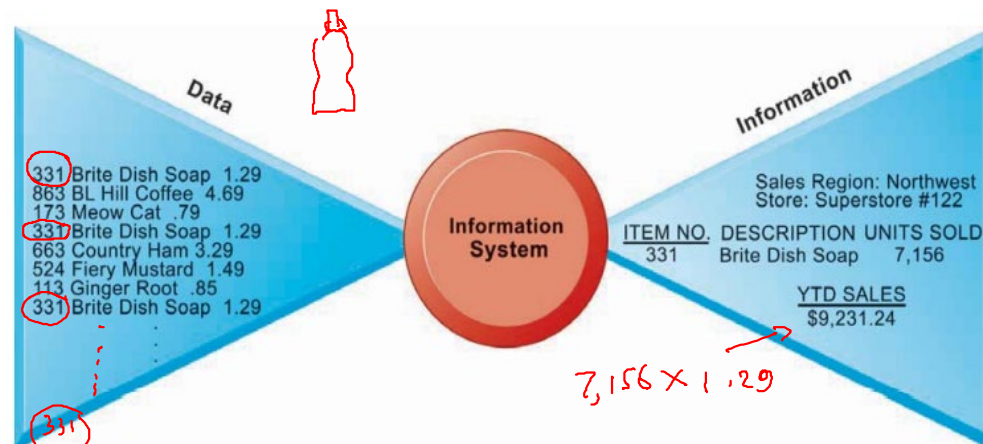7,156 × 1.29

Raw data from a supermarket checkout counter can be processed and organized to produce meaningful information, such as the total unit sales of dish detergent or the total sales revenue from dish detergent for a specific store or sales territory.

What is a system?

- A system is **a collection of elements or components that are organized for a common purpose**.
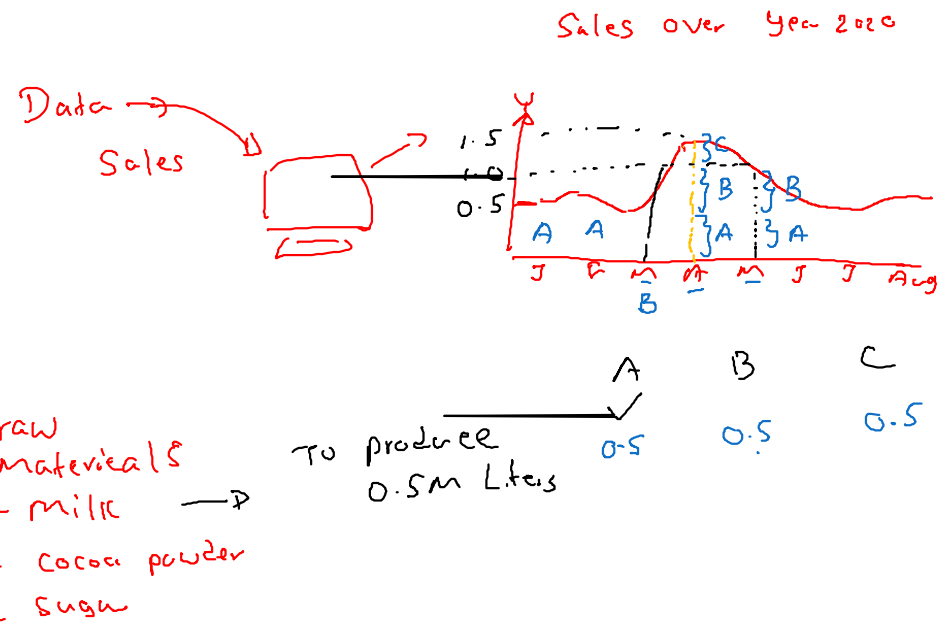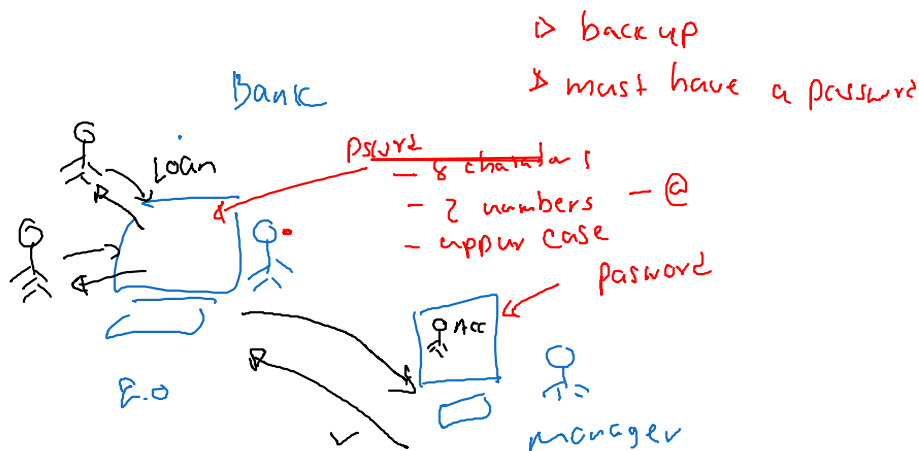
Nervous system

solar system

WHAT IS AN INFORMATION SYSTEM?

- An information system is a set of interrelated components that collect (or retrieve), process, store, and distribute information to support decision making and control in an organization.
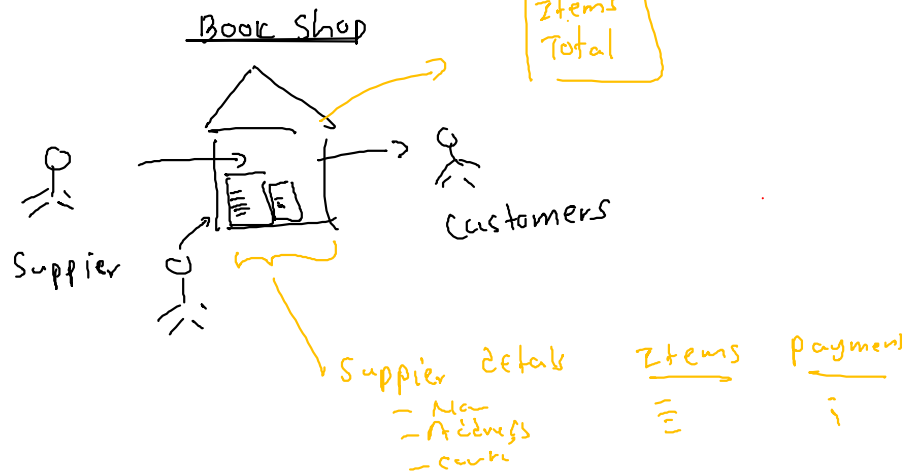
Computer based Information system

- It is an arrangement of **Computer Technology** (Hardware & Software) **and Telecommunication Technology** to support and improve day to day operations, problem solving and decision making needs of management and users.

- It is a data processing system into a high-quality information and can be used as tools that support decision-making, coordination and control as well as visualization and analysis.
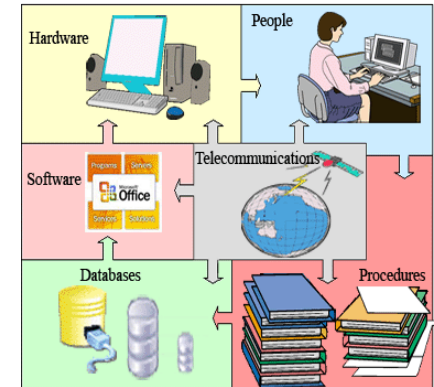
System

Manually

Book Shop

Summary

Items
Total

Supplier

Customers

Supplier details
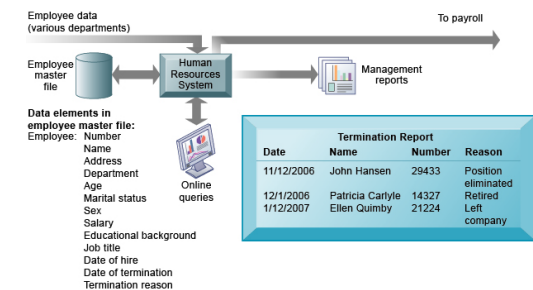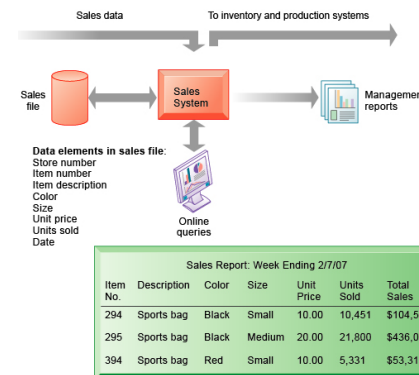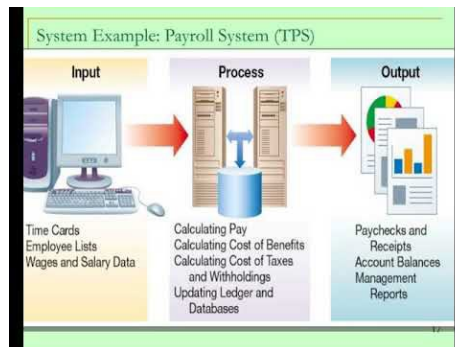– Na
– Address
– cont
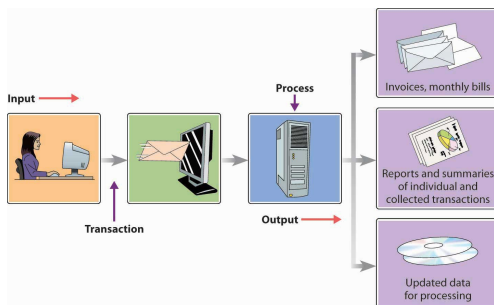
Items

Payment

Computer Based Information Systems(CBIS)

- The **resources** of a CBIS include,
  – hardware
  – software
  – databases
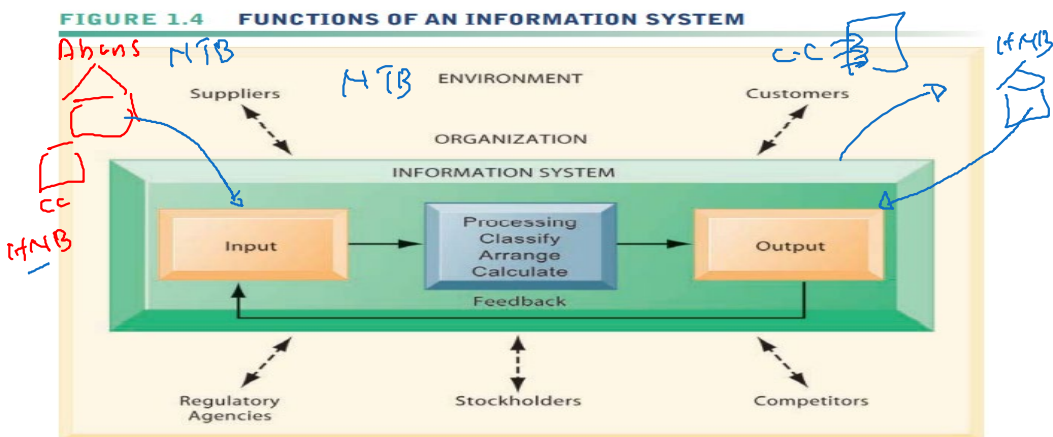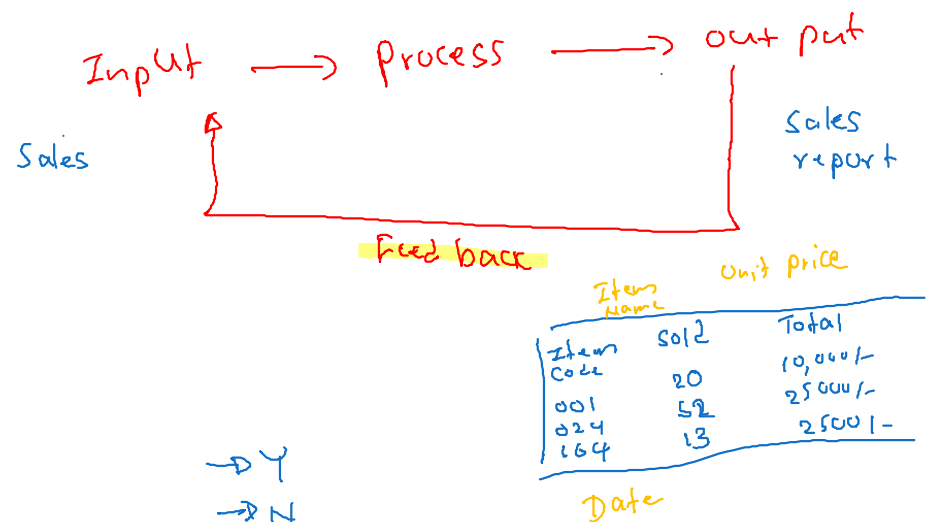 – telecommunications
  – people
  – procedures

Hardware — People — Software — Telecommunications — Databases — Procedures

Different types of information systems are there in organizations

Input
Process
Transaction
Output

Invoices, monthly bills

Reports and summaries of individual and collected transactions

Updated data for processing

System Example: Payroll System (TPS)

Input	Process	Output
Time Cards, Employee Lists, Wages and Salary Data	Calculating Pay, Calculating Cost of Benefits, Calculating Cost of Taxes and Withholdings, Updating Ledger and Databases	Paychecks and Receipts, Account Balances, Management Reports

Sales data — To inventory and production systems

Sales file — Sales System — Management reports

Online queries

Data elements in sales file:
Store number
Item number
Item description
Color
Size
Unit price
Units sold
Date

Sales Report: Week Ending 2/7/07

Item No.	Description	Color	Size	Unit Price	Units Sold	Total Sales
294	Sports bag	Black	Small	10.00	10,451	$104,510
295	Sports bag	Black	Medium	20.00	21,800	$436,000
394	Sports bag	Red	Small	10.00	5,331	$53,310

Employee data (various departments) — To payroll

Employee master file — Human Resources System — Management reports

Online queries

Data elements in employee master file:
Employee: Number
Name
Address
Department
Age
Marital status
Sex
Salary
Educational background
Job title
Date of hire
Date of termination
Termination reason

Termination Report

Date	Name	Number	Reason
11/12/2006	John Hansen	29433	Position eliminated
12/1/2006	Patricia Carlyle	14327	Retired
1/12/2007	Ellen Quimby	21224	Left company

Functions of an Information System

- **Input** captures or collects raw data from within the organization or from its external environment.
- **Processing** converts this raw input into a meaningful form.
- **Output** transfers the processed information to the people who will use it or to the activities for which it will be used.
- **Feedback**, which is output that is returned to appropriate members of the organization to help them evaluate or correct the input stage.

[Handwritten annotations: Input → Process → Output; Sales; Sales report; Feed back; Item Name; Unit Price; Item Code / Sold / Total; 001 20 10,000/-; 024 52 25000/-; 164 13 25001/-; Date; →Y →N]

[Handwritten: credit card payment]

Functions of an Information System

FIGURE 1.4 FUNCTIONS OF AN INFORMATION SYSTEM

An information system contains information about an organization and its surrounding environment. Three basic activities—input, processing, and output—produce the information organizations need. Feedback is output returned to appropriate people or activities in the organization to evaluate and refine the input. Environmental actors, such as customers, suppliers, competitors, stockholders, and regulatory agencies, interact with the organization and its information systems.
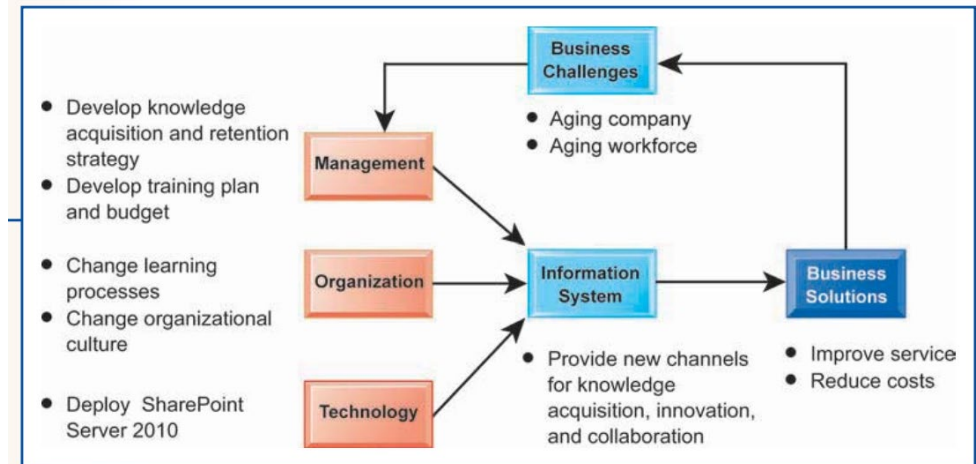
ACTIVITY 1

DIMENSIONS OF INFORMATION SYSTEMS

Graphical illustration of how management, organization, and technology elements work together to create an information system solution to the business challenges

- Using information systems effectively requires an understanding of the **organization, management, and information technology** shaping the systems.
- An information system creates value for the firm as an organizational and management solution to challenges posed by the environment.

---

what Information systems will be able to do?

- Increasing market share
- becoming the high-quality or low-cost production.
- developing new products
- increasing employee productivity

1. Organizational dimension of information system

Organization

- An organized group of people who have a common goal and work together.
- The key elements of an organization are its people, structure, business processes, politics, and culture.
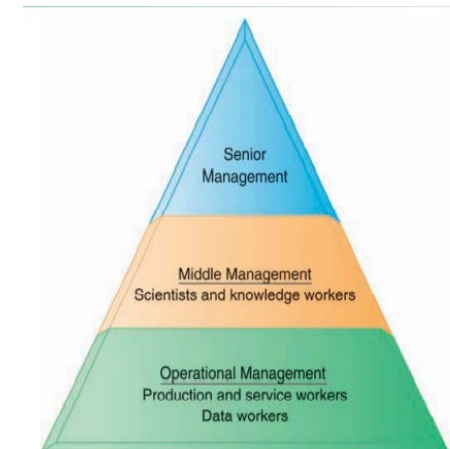
Organizational people

- Senior management
- Middle management
- Operational management
- Knowledge workers
- Data workers
- Production or service workers

Organizational structure

- Organizations have a structure that is composed of different levels and specialties.
- Their structures reveal a clear-cut division of labor, Authority and responsibility in a business firm are organized as a hierarchy, or a pyramid structure.
- The upper levels of the hierarchy consist of managerial, professional, and technical employees, whereas the lower levels consist of operational personnel

Senior Management

Middle Management
Scientists and knowledge workers

Operational Management
Production and service workers
Data workers

Organizational business process

- Business Process is a set of tasks that directly or indirectly help your business provide the products/services to the customer.
- organizations' business processes include formal rules that have been developed over a long time for accomplishing tasks. rules guide employees in a variety of procedures.

example of Business Process

Marketing agency processes can be a bit tricky as there is more qualitative output to be delivered. Here are the steps of an ad creation process:

Industry: Marketing
Company type: Ad agency
Process: Ad creation

1. Understanding client requirements
2. Brainstorming idea for the ad
3. Preparing a campaign
4. Pitching the idea to the client
5. Getting the approval
6. Making necessary changes
7. Providing the deliverables

Organizational politics and culture

- Parts of an organization's culture can always be found embedded in its information systems
- Culture can be defined as the consistent organizational behaviors of employees and leaders (norms).
- Organizational culture facilitates the achievement of an organization's strategic objectives.
- Organizational culture often mirrors the organization's core values and directly reflects the organization's leadership.
- Organizational politics is referred to the self-interest and agenda of an individual in an organization without any concern about its impact on the objective of the company to achieve its goals.

## 2. Management dimension of Information System

- Information technology can play a powerful role in helping managers to
  - Design and deliver new products and services
  - Redirecting and redesigning their organizations.
  - Make decisions
  - Formulate action plans to solve organizational problems.
- Managers set the organizational strategy for responding to those challenges.

3. Technology dimension of Information Technology

- **Computer hardware** is the physical equipment used for input, processing, and output activities in an information system.
- **Computer software** consists of the detailed, preprogrammed instructions that control and coordinate the computer hardware components in an information system.
- **Data management technology** consists of the software governing the organization of data on physical storage media.
- **Networking and telecommunications technology**, consisting of both physical devices and software, links the various pieces of hardware and transfers data from one physical location to another.
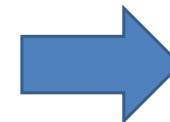
**ACTIVITY 2**

Information quality Dimensions

- High-quality decisions require high-quality information.

QUALITY DIMENSION	DESCRIPTION
Accuracy	Do the data represent reality?
Integrity	Are the structure of data and relationships among the entities and attributes consistent?
Consistency	Are data elements consistently defined?
Completeness	Are all the necessary data present?
Validity	Do data values fall within defined ranges?
Timeliness	Are data available when needed?
Accessibility	Are the data accessible, comprehensible, and usable?

Categories of information

- There are three main categories of business information. These are related to the purpose for which the information is utilized.

-
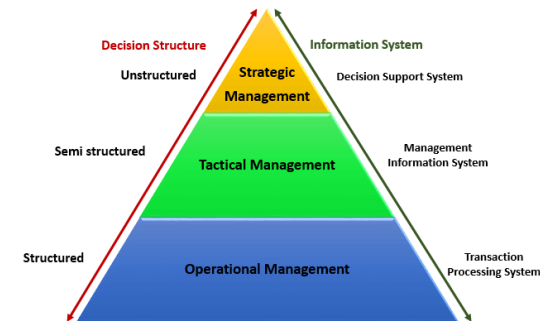
Types of Information that are required at Different Levels of Management

- **STRATEGIC INFORMATION**:- This relates long-term planning policies and is therefore of most interest to top management.

- **TACTICAL INFORMATION**:- This is of use in sort-term planning, i.e. months rather than year, and is of more interest at departmental level

- **OPERATIONAL INFORMATION**:- This applies to the short-term, perhaps hourly, running of a department.

Questions

- Distinguish between data and information ?

- How are information systems transforming business, and why are they essential for running and managing a business today?

- What is an information system? How does it work? What are its management, organization, and technology components?

HNDIT1042 Information Management and Information Systems

Organizations and Management hierarchy Type of information (Strategic, Tactical, Operational)

WEEK 2 AND WEEK 3

Learning Objectives

- Define and describe business processes and their relationship to information systems.
- Evaluate the role played by systems serving the various levels of management in a business and their relationship to each other.
- Describe the information systems supporting the major business functions
- Explain how enterprise applications improve organizational performance.

what Information systems will be able to do?

- Increasing market share
- becoming the high-quality or low-cost producer.
- developing new products
- increasing employee productivity

Business processes

- Business processes are the collection of activities required to produce a product or service.

- Every business can be seen as a collection of business processes.
- Many business processes are tied to a specific functional area.
- For example
  - the sales and marketing function is responsible for identifying customers,
  - the human resources function is responsible for hiring employees.

Business Processes and Information Systems

- Examples of functional business processes

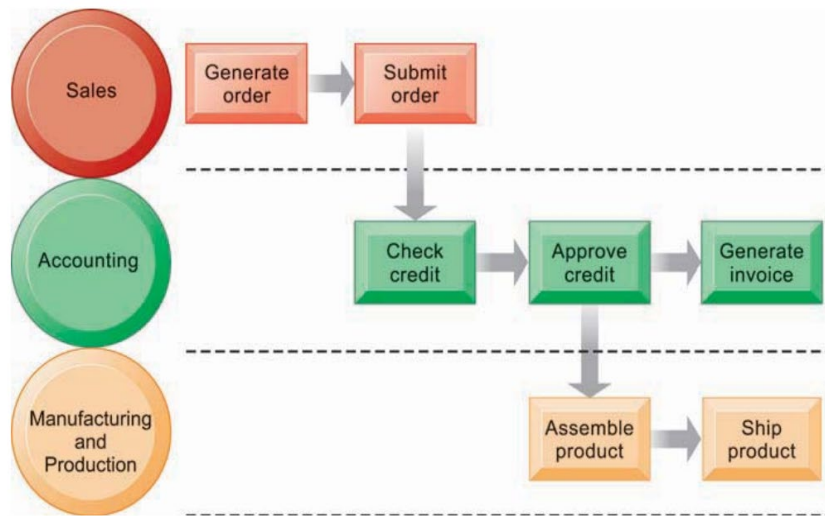| FUNCTIONAL AREA	BUSINESS PROCESS
Manufacturing and production	Assembling the product Checking for quality Producing bills of materials
Sales and marketing	Identifying customers Making customers aware of the product Selling the product
Finance and accounting	Paying creditors Creating financial statements Managing cash accounts
Human resources	Hiring employees Evaluating employees' job performance Enrolling employees in benefits plans

simple business process of fulfilling a customer order

- the sales department receives a sales order.
- The order passes first to accounting to ensure the customer can pay for the order either by a credit verification or request for immediate payment prior to shipping.
- Once the customer credit is established, the production department pulls the product from inventory or produces the product.
- Then the product is shipped.
- A bill or invoice is generated by the accounting department, and a notice is sent to the customer indicating that the product has shipped.
- The sales department is notified of the shipment and prepares to support the customer by answering calls or fulfilling warranty claims

FIGURE 2.1 THE ORDER FULFILLMENT PROCESS

Fulfilling a customer order involves a complex set of steps that requires the close coordination of the sales, accounting, and manufacturing functions.

How do information systems improve business processes?

- Information systems automate many steps in business processes that were formerly performed manually
  - such as checking a client's credit,
  - generating an invoice and shipping order

TYPES OF INFORMATION SYSTEMS

Types of Information Systems

Three main categories of information systems serve different organizational levels:

- Operational-level systems: support operational managers, keeping track of the elementary activities and transactions
- Management-level systems: serve the monitoring, controlling, decision-making, and administrative activities
- Strategic-level systems: help senior management tackle and address strategic issues
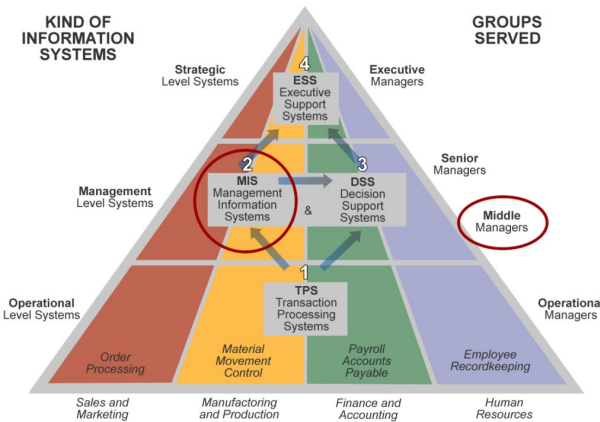
SYSTEMS FOR DIFFERENT MANAGEMENT GROUPS

The four major types of information systems

Top Level Management
Strategic Decisions
•DSS, ESS, EIS, AI, Office Automation

Middle level Management
Tactical Decisions
•MIS, DSS, AI, Office Automation

Low level Management
Operational Decisions
•TPS, AI, Office Automation

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Transaction Processing Systems

- keep track of the elementary activities and transactions of the organization.
  - sales, receipts, cash deposits, payroll, credit decisions, and the flow of materials in a factory.
- Performs and records the daily routine transactions necessary to conduct business
  - sales order entry, hotel reservations, payroll, employee record keeping, and shipping.
- Answer routine questions and to track the flow of transactions through the organization.
  - Eg: How many parts are in inventory? What happened to Mr. Smith's payment? To answer these kinds of questions

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payroll system

- A payroll system keeps track of money paid to employees. An employee time sheet with the employee's name, social security number, and number of hours worked per week represents a single transaction for this system. Once this transaction is input into the system, it updates the system's master file that permanently maintains employee information for the organization. The data in the system are combined in different ways to create reports of interest to management and government agencies and to send paychecks to employees.

15

FIGURE 2.2   A PAYROLL TPS
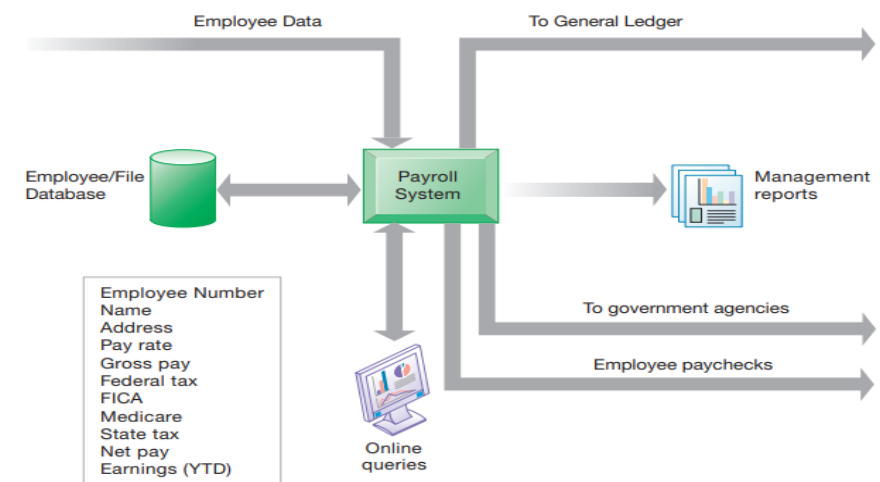
Payroll data on master file

A TPS for payroll processing captures employee payment transaction data (such as a time card). System outputs include online and hard-copy reports for management and employee paychecks.

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SYSTEMS FOR BUSINESS INTELLIGENCE FOR MIDDLE MANAGEMENT

Business intelligence

- ▪ Data and software tools for organizing and analyzing data

  Used to help managers and users make informed decisions

- • Business intelligence systems
  - ▪ Management information systems
  - ▪ Decision support systems
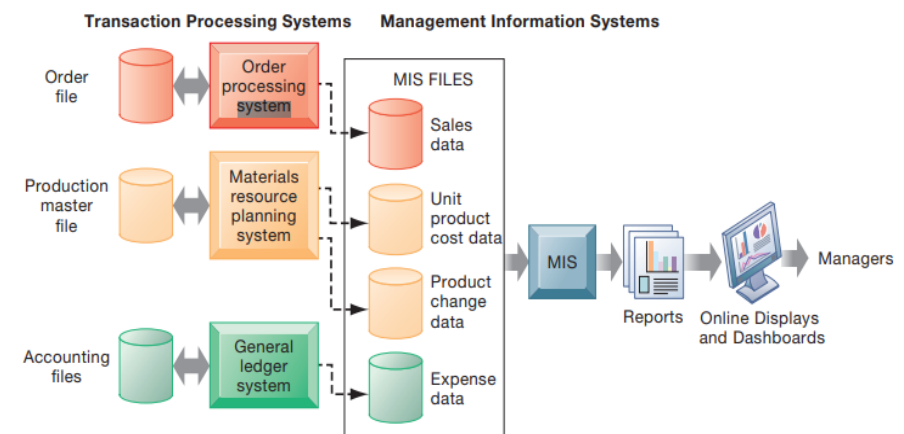 - ▪ Executive support systems

17

18

management information systems (MIS)

- • Summarize and report on the company's basic operations using data supplied by transaction processing systems.
- • serving middle management.
- • Provide middle managers with reports on the organization's current performance.
- • Inflexible
- • Have little analytical capability.
- • Use simple routines, such as summaries and comparisons.

FIGURE 2.3 HOW MANAGEMENT INFORMATION SYSTEMS OBTAIN THEIR DATA FROM THE ORGANIZATION'S TPS
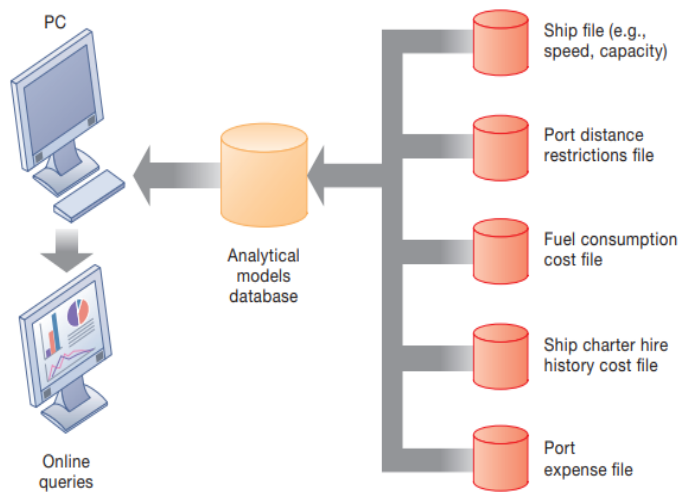
In the system illustrated by this diagram, three TPS supply summarized transaction data to the MIS reporting system at the end of the time period. Managers gain access to the organizational data through the MIS, which provides them with the appropriate reports.

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Sample report

Consolidated Consumer Products Corporation Sales by Product and Sales Region: 2011

PRODUCT CODE	PRODUCT DESCRIPTION	SALES REGION	ACTUAL SALES	PLANNED	ACTUAL versus PLANNED
4469	Carpet Cleaner	Northeast	4,066,700	4,800,000	0.85
		South	3,778,112	3,750,000	1.01
		Midwest	4,867,001	4,600,000	1.06
		West	4,003,440	4,400,000	0.91
	TOTAL		16,715,253	17,550,000	0.95
5674	Room Freshener	Northeast	3,676,700	3,900,000	0.94
		South	5,608,112	4,700,000	1.19
		Midwest	4,711,001	4,200,000	1.12
		West	4,563,440	4,900,000	0.93
	TOTAL		18,559,253	17,700,000	1.05

21

Decision Support System

- DSS use internal information from TPS and MIS.
- Serve middle management
- Support non-routine decision making
  - Example: What is the impact on production schedule if December sales doubled?

22

DSS for Voyage-estimating system

- The voyage-estimating system of a large global shipping company that transports bulk cargoes of coal, oil, ores, and finished products. The firm owns some vessels, charters others, and bids for shipping contracts in the open market to carry general cargo. A voyage estimating system calculates financial and technical voyage details. Financial calculations include ship/time costs (fuel, labor, capital), freight rates for various types of cargo, and port expenses. Technical details include a myriad of factors, such as ship cargo capacity, speed, port distances, fuel and water consumption, and loading patterns (location of cargo for different ports). The system can answer questions such as the following: Given a customer delivery schedule and an offered freight rate, which vessel should be assigned at what rate to maximize profits? What is the optimal speed at which a particular vessel can optimize its profit and still meet its delivery schedule? What is the optimal loading pattern for a ship bound for the U.S. West Coast from Malaysia? Figure 2.5 illustrates the DSS built for this company.

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FIGURE 2.5 VOYAGE-ESTIMATING DECISION-SUPPORT SYSTEM

This DSS operates on a powerful PC. It is used daily by managers who must develop bids on shipping contracts.

Executive support systems (ESS)

- Support senior management.
- Address non-routine decisions requiring judgment, evaluation, and insight because there is no agreed-on procedure for arriving at a solution.
- Present graphs and data from many sources through an interface.
- Incorporate data about external events (such as new tax laws or competitors,) as well as summarized information from internal MIS and DSS.
- They filter, compress, and track critical data, displaying the data of greatest importance to senior managers.
- Systems include business intelligence analytics for analyzing trends, forecasting, and "drilling down" to data at greater levels of detail.

ESS example

- the CEO of Leiner Health Products, the largest manufacturer of private-label vitamins and supplements in the United States, has an ESS that provides on his desktop a minute-to-minute view of the firm's financial performance as measured by working capital, accounts receivable, accounts payable, cash flow, and inventory. The information is presented in the form of a digital dashboard, which displays on a single screen graphs and charts of key performance indicators for managing a company. Digital dashboards are becoming an increasingly popular tool for management decision makers.
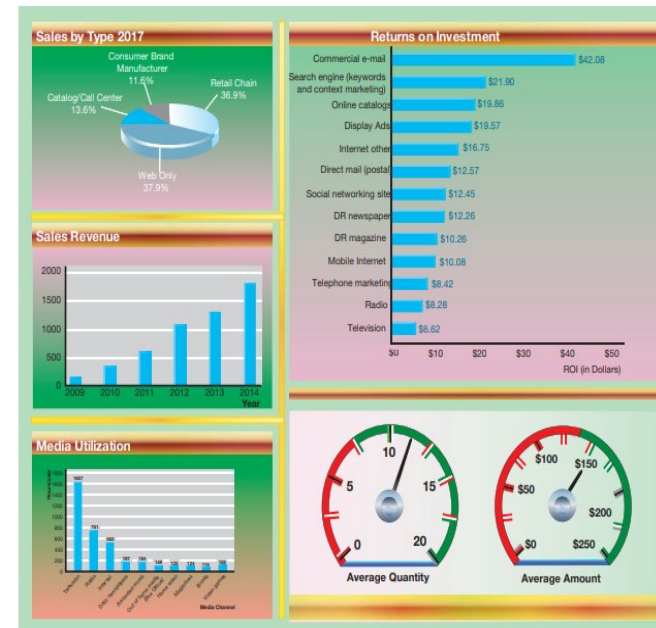
A digital dashboard delivers comprehensive and accurate information for decision making, often using a single screen. The graphical overview of key performance indicators helps managers quickly spot areas that need attention.

ENTERPRISE APPLICATIONS

Enterprise Application

- Because of the organizational growth and acquisition of smaller firms system become collection of systems. Implement enterprise application to getting them as a single system.

Advantages

- Businesses become more flexible and productive by coordinating their business processes more closely and integrating groups of processes.
- Efficient management of resources and customer service.

Four major enterprise applications

1. Enterprise systems
2. Supply chain management systems
3. Customer relationship management systems
4. Knowledge management systems.

Slide 33

FIGURE 2.6 ENTERPRISE APPLICATION ARCHITECTURE

Suppliers, Business Partners

Customers, Distributors

Processes

Enterprise Systems

Supply Chain Management Systems

Processes

Customer Relationship Management Systems

Processes

Knowledge Management Systems

Sales and Marketing | Manufacturing and Production | Finance and Accounting | Human Resources

FUNCTIONAL AREAS
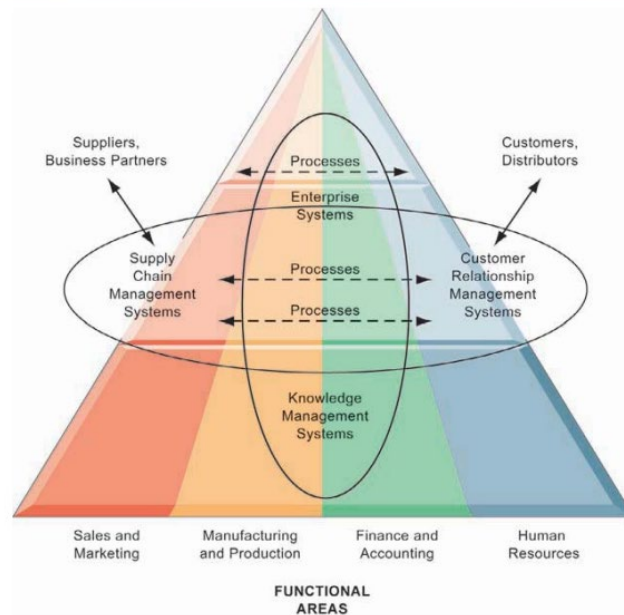
1. Enterprise Systems

- enterprise systems, also known as enterprise resource planning (ERP) systems, to integrate business processes in manufacturing and production, finance and accounting, sales and marketing, and human resources into a single software system.
- Information that was previously fragmented in many different systems is stored in a single comprehensive data repository where it can be used by many different parts of the business

Slide 35

FIGURE 9.1 HOW ENTERPRISE SYSTEMS WORK

Finance & Accounting
- Cash on hand
- Accounts receivable
- Customer credit
- Revenue

Sales & Marketing
- Orders
- Sales forecasts
- Return requests
- Price changes

Centralized Database

Human Resources
- Hours worked
- Labor cost
- Job skills

Manufacturing & Production
- Materials
- Production schedules
- Shipment dates
- Production capacity
- Purchases
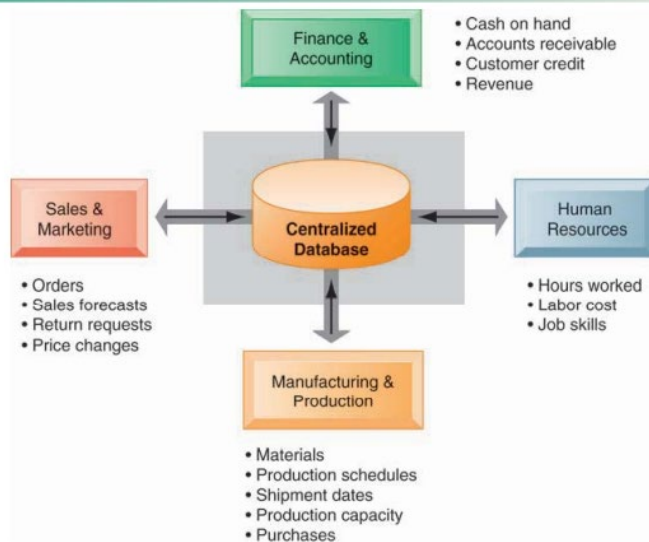
Enterprise systems feature a set of integrated software modules and a central database that enables data to be shared by many different business processes and functional areas throughout the enterprise.

Example for ERP

- when a customer places an order, the order data flow automatically to other parts of the company that are affected by them.
- The order transaction triggers the warehouse to pick the ordered products and schedule shipment.
- The warehouse informs the factory to replenish whatever has been depleted.
- The accounting department is notified to send the customer an invoice.
- Customer service representatives track the progress of the order through every step to inform customers about the status of their orders.
- Managers are able to use firmwide information to make more precise and timely decisions about daily operations and longer-term planning.

2. Supply chain management systems

- Help manage relationships with their suppliers.
- These systems help suppliers, purchasing firms, distributors, and logistics companies share information about orders, production, inventory levels, and delivery of products and services
- The ultimate objective is to get the right amount of their products from their source to their point of consumption in the least amount of time and at the lowest cost.

Eg: the supply chain for Nike sneakers

- Nike designs, markets, and sells sneakers, socks, athletic clothing, and accessories throughout the world.
- Its primary suppliers are contract manufacturers with factories in China, Thailand, Indonesia, Brazil, and other countries.
- These companies fashion Nike's finished products.
- Nike's contract suppliers do not manufacture sneakers from scratch. They obtain components for the sneakers—the laces, eyelets, uppers, and soles—from other suppliers and then assemble them into finished sneakers.
- These suppliers in turn have their own suppliers. For example, the suppliers of soles have suppliers for synthetic rubber, suppliers for chemicals used to melt the rubber for molding, and suppliers for the molds into which to pour the rubber.
- Suppliers of laces have suppliers for their thread, for dyes, and for the plastic lace tips.

- Chart illustration of Nike's supply chain for sneakers; it shows the flow of information and materials among suppliers, Nike, Nike's distributors, retailers, and customers. Nike's contract manufacturers are
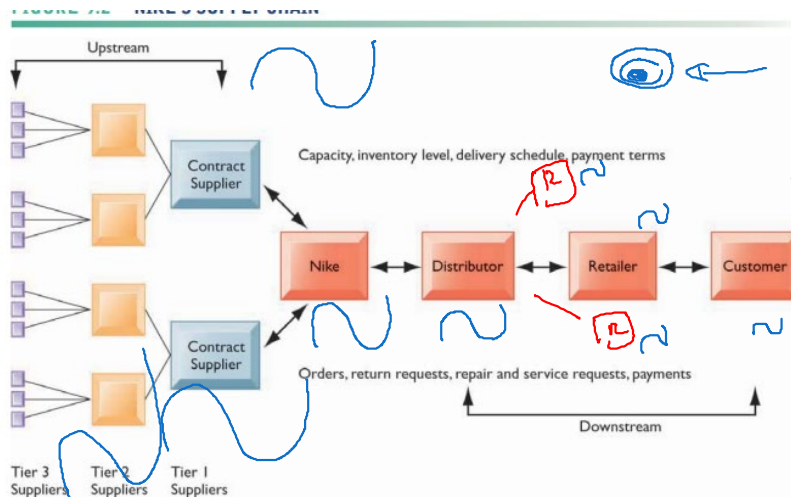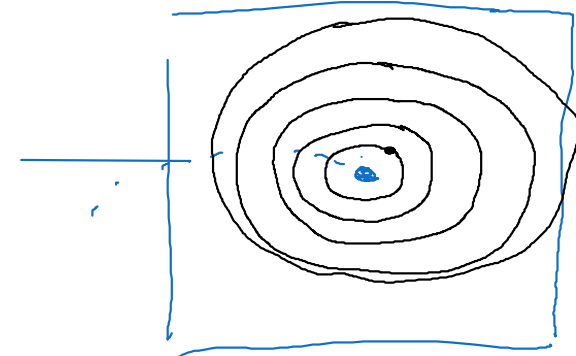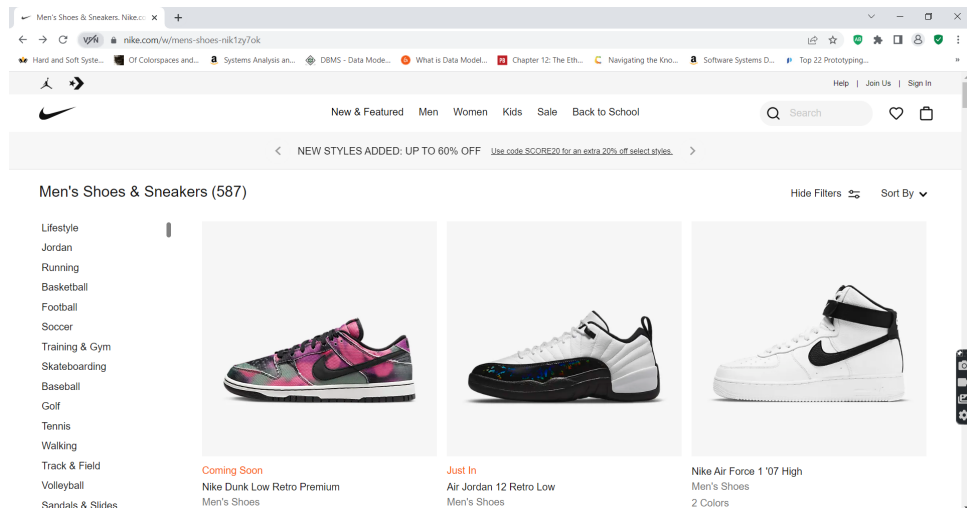
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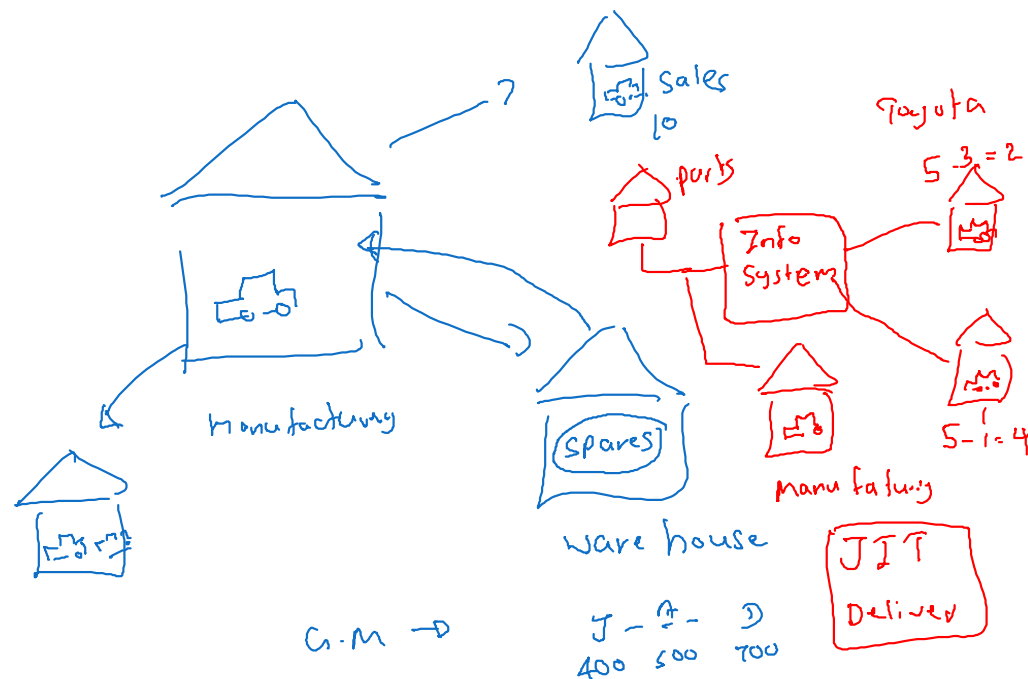
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Advantages

- Increase firm profitability by lowering the costs of moving and making products.
- Enabling managers to make better decisions about how to organize and schedule sourcing, production, and distribution.

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3. Customer relationship management systems

- (CRM) systems to help manage their relationships with their customers.
- CRM systems provide information to coordinate all of the business processes that deal with customers in sales, marketing, and service to optimize revenue, customer satisfaction, and customer retention.

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Advantages

- This information helps firms identify, attract, and retain the most profitable customers;
- provide better service to existing customers;
- increase sales.
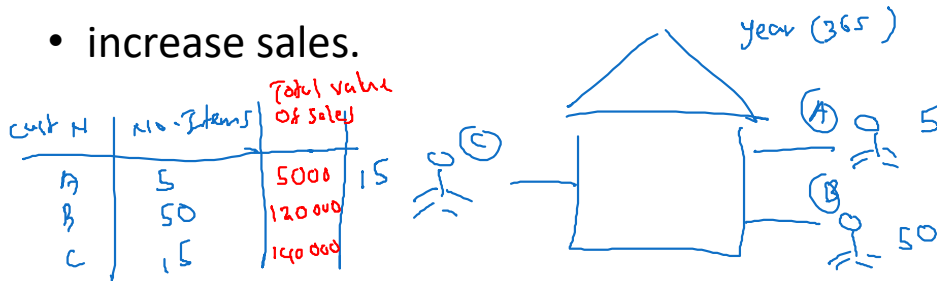
CRM..

- CRM capture and integrate customer data from all over the organization, consolidate the data, analyze the data, and then distribute the results to various systems and customer touch points across the enterprise.

Touch point

- A touch point (also known as a contact point) is a method of interaction with the customer.

Eg: telephone, e-mail, customer service desk, conventional mail, Facebook, Twitter, Web site, wireless device, or retail store.

FIGURE 9.6   CUSTOMER RELATIONSHIP MANAGEMENT (CRM)

Sales
- Telephone sales
- Web sales
- Retail store sales
- Field sales

Customer

Marketing
- Campaign data
- Content
- Data analysis

Service
- Call center data
- Web self-service data
- Wireless data
- Field service data
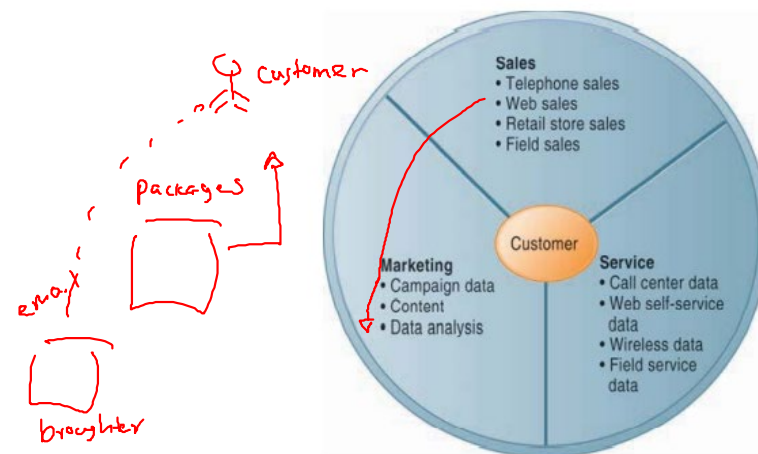
CRM systems examine customers from a multifaceted perspective. These systems use a set of integrated applications to address all aspects of the customer relationship, including customer service, sales, and marketing.

Good CRM systems provide data and analytical tools for answering questions such as these:

Marketing

- What is the value of a particular customer to the firm over his or her lifetime?
- Who are our most loyal customers?
- It can cost six times more to sell to a new customer than to an existing customer.
- Who are our most profitable customers?
- What do these profitable customers want to buy?

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4. Knowledge Management Systems

- Have better knowledge about how to create, produce, and deliver products and services.
- This firm knowledge is unique, difficult to imitate, and can be leveraged into long-term strategic benefits.
- Knowledge management systems (KMS) enable organizations to better manage processes for capturing and applying knowledge and expertise.
- These systems collect all relevant knowledge and experience in the firm, and make it available wherever and whenever it is needed to improve business processes and management decisions.

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- Three major types of knowledge management systems:
  1. enterprise-wide knowledge management systems
  2. knowledge work systems
  3. intelligent techniques
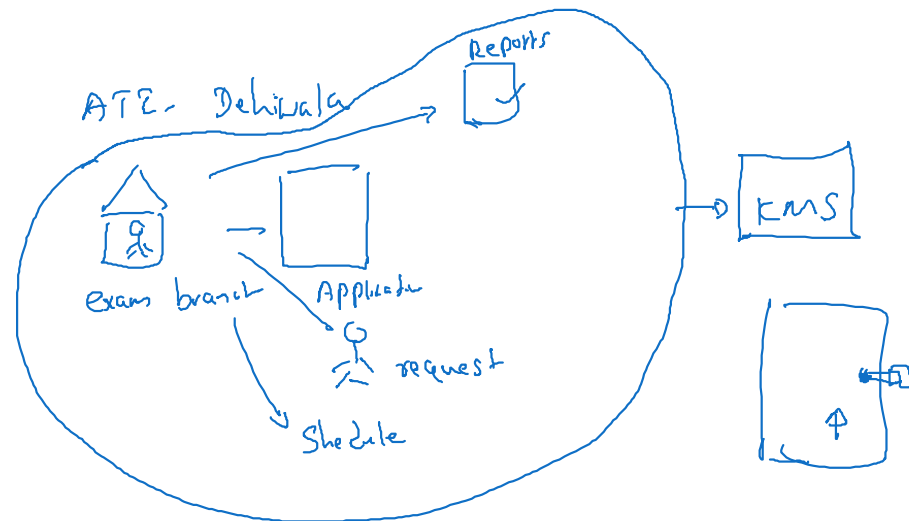
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1. enterprise-wide knowledge management systems

- General-purpose firmwide efforts to collect, store, distribute, and apply digital content and knowledge.
- These systems include capabilities for searching for information, storing both structured and unstructured data, and locating employee expertise within the firm.
- supporting technologies are:
  - portal
  - search engines
  - collaboration and social business tools
  - learning management systems.

(handwritten annotations: website, Q-?, Answer, AT, LMS, expert, New employee)
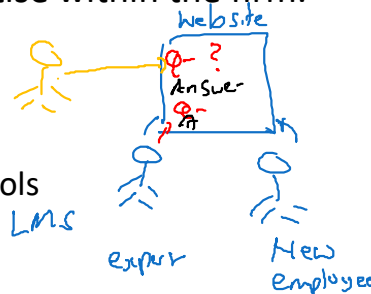
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2. Knowledge work systems (KWS)

- Specialized systems built for engineers, scientists, and other knowledge workers charged with discovering and creating new knowledge for a company

(handwritten: Operat.)

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(handwritten pyramid slide: Robots, 2015, 2020, ESS, Marketing O2, Director, engineers O2, engineers KWS, engineers MIS, KWS, Managers, engineers/Scientists, T.P.S, KWS, Share)

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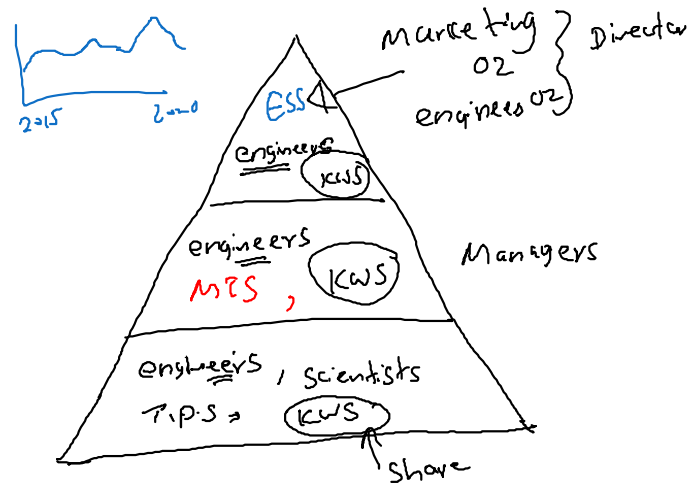
FIGURE 11.4 REQUIREMENTS OF KNOWLEDGE WORK SYSTEMS

External knowledge base

SOFTWARE
Graphics -> Visualization
Modeling -> Simulation
Document management
Communications

User interface

Hardware platform: knowledge workstation
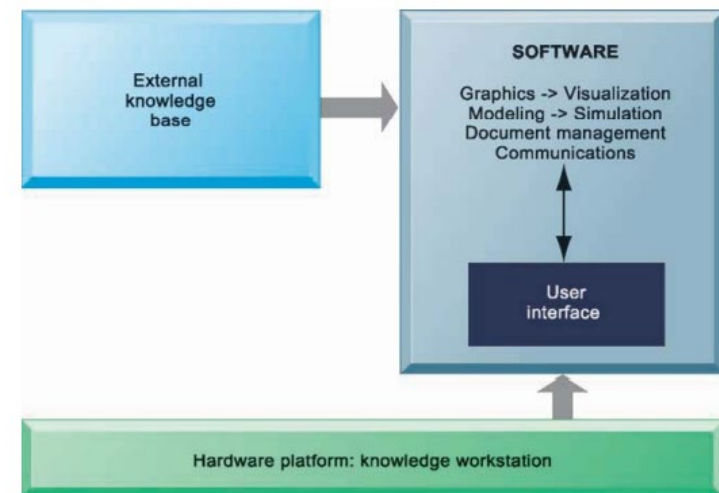
Knowledge work systems require strong links to external knowledge bases in addition to specialized hardware and software.

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EXAMPLES OF KNOWLEDGE WORK SYSTEMS

- CAD systems
- virtual reality systems for simulation and modeling
- financial workstations.

(handwritten annotations: Ms Office, PS-, Auto Cad, 150/- 300/- 50/- 60/- 10,000/-, 1 M)

CAD
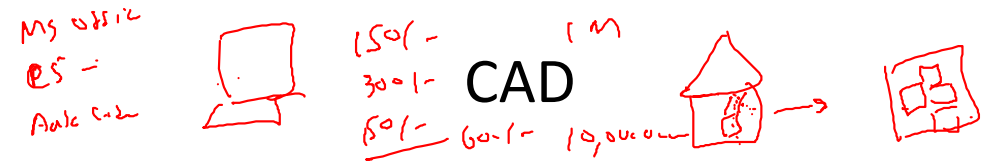
- Computer-aided design (CAD) automates the creation and revision of designs, using computers and sophisticated graphics software.
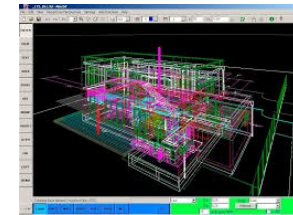
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virtual reality systems for simulation and modeling

- Virtual reality systems have visualization, rendering, and simulation capabilities that go far beyond those of conventional CAD systems.

example

- Ford Motor Company has been using virtual reality to help design its vehicles.
- In one example of Ford's Immersive Virtual Environment, a designer was presented with a car seat, steering wheel, and blank dashboard.
- Wearing virtual reality glasses and gloves with sensors, the designer was able to "sit" in the seat surrounded by the vehicle's 3-D design to experience how a proposed interior would look and feel. The designer would be able to identify blind spots or see if knobs were in an awkward place.
- Ford's designers could also use this technology to see the impact of a design on manufacturing.

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Augmented reality (AR)

- It is a related technology for enhancing visualization.
- AR provides a live direct or indirect view of a physical real-world environment whose elements are augmented by virtual computer-generated imagery.
- The user is grounded in the real physical world, and the virtual images are merged with the real view to create the augmented display.

Virtual Reality Modeling Language (VRML).

- VRML is a set of specifications for interactive, 3-D modeling on the World Wide Web that can organize multiple media types, including animation, images, and audio to put users in a simulated real-world environment.
- VRML is platform independent, operates over a desktop computer, and requires little bandwidth.

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example
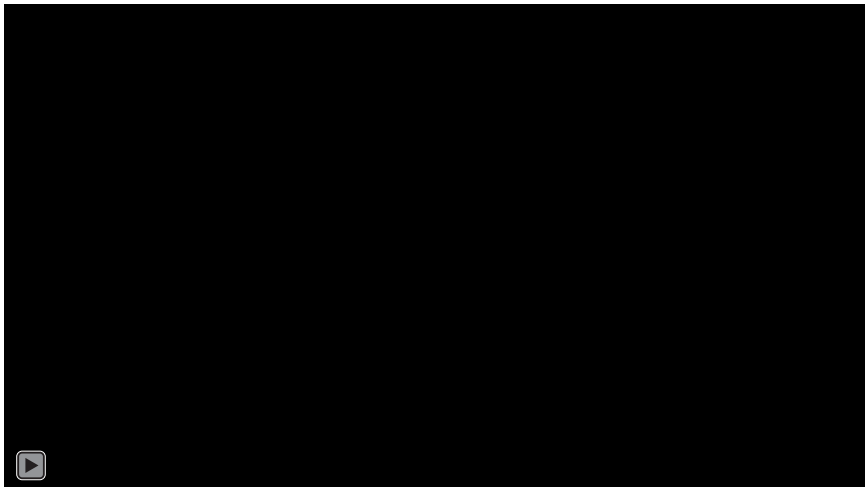
- What Is the Difference Between **AR and VR**?
- Where can we find the usage of AI?

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financial workstations

- The financial industry is using specialized investment workstations such as Bloomberg Terminals to leverage the knowledge and time of its brokers, traders, and portfolio managers.

The **Bloomberg Terminal** is a computer software system provided by the financial data vendor Bloomberg L.P. that enables professionals in the financial service sector and other industries to access Bloomberg Professional Services through which users can monitor and analyze real-time financial market data and place trades on the electronic trading platform

TABLE 11.2 EXAMPLES OF KNOWLEDGE WORK SYSTEMS

KNOWLEDGE WORK SYSTEM	FUNCTION IN ORGANIZATION
CAD/CAM (computer-aided manufacturing)	Provides engineers, designers, and factory managers with precise control over industrial design and manufacturing
Virtual reality systems	Provide drug designers, architects, engineers, and medical workers with precise, photorealistic simulations of objects
Investment workstations	High-end PCs used in the financial sector to analyze trading situations instantaneously and facilitate portfolio management

3. intelligent techniques

- Artificial intelligence and database technology provide a number of intelligent techniques that organizations can use to capture individual and collective knowledge and to extend their knowledge base.
  - Expert systems, case-based reasoning,
  - fuzzy logic are used for capturing tacit knowledge.
  - Neural networks and data mining are used for knowledge discovery.

END

sociotechnical systems
Advanced Technological Institute

sociotechnical systems

- Information systems are sociotechnical systems.
- Though they are composed of machines, devices, and "hard" physical technology, they require substantial social, organizational, and intellectual investments to make them work properly.

sociotechnical system..

- Inside a sociotechnical system (STS), you'll find people, software, hardware, the organization, and any number of other systems functioning together as a whole.

Socio-technical system

- Socio-technical system is a mixture of people and technology.
- It consists of many items. These items are difficult to distinguish from each other because they all have close inter-relationships.

components

- The system include non-technical elements such as people, processes, regulations, goals, culture, etc.,
- as well as technical components such as computers, software, infrastructure, etc.

Socio Technical System in Action...

Sociotechnical system layers

SYSTEMS ENGINEERING

SOCIETY
ORGANIZATION
BUSINESS PROCESSES
APPLICATION SYSTEM
COMMUNICATIONS AND DATA MANAGEMENT
OPERATING SYSTEM
EQUIPMENT

SOFTWARE ENGINEERING
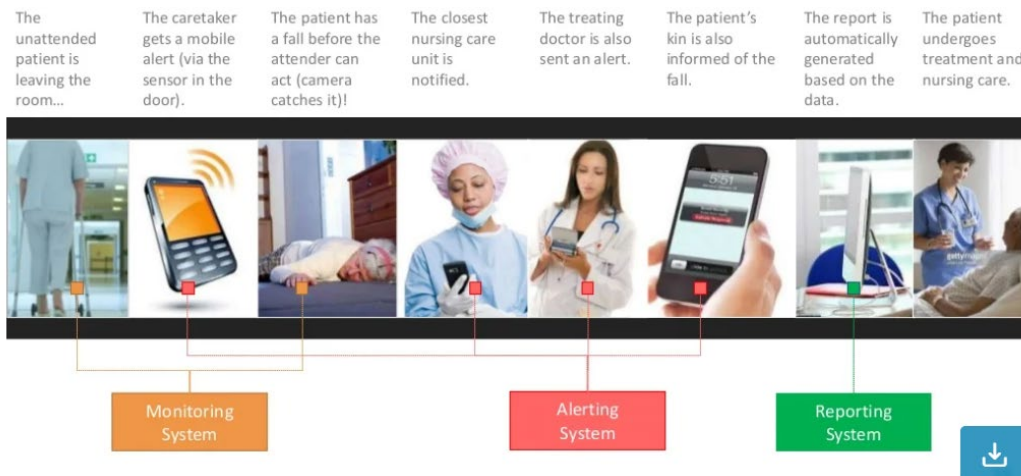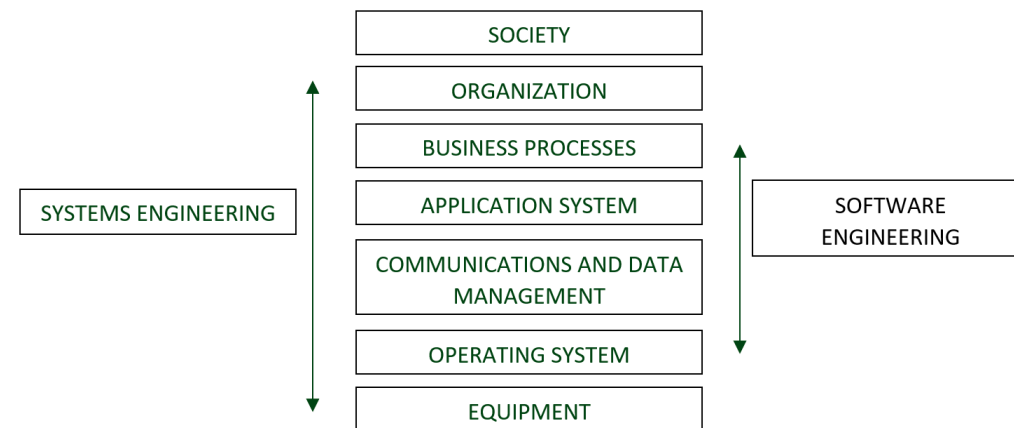
Sociotechnical system layers

1. **Organizational layer:** Strategy, management, and internal regulations and processes
2. **Social layer:** The broader culture, regulatory environment, and laws outside of the organization as well as the people who are end-users and customers

3. **Business process layer:** Business activity-supported processes that define how technology is used internally and how the business operates
4. **Equipment layer:** Hardware the business relies upon for development and operations
5. **Operating system layer:** Systems that bring hardware and other software together

6. **Data management and communications layer:** Layer that bridges the operating system and the application so information can be used and managed appropriately
7. **Application layer:** Software that customers or end-users see and interact with. It provides the user interface and is often the most visible layer of the STS

Let's use email providers as examples of STSs.

- Consider how Gmail, Hotmail, Outlook, and other email systems could be described and analyzed. Each of these systems is distinct, but they also interact with other systems in an STS to form a functional email program:
- **Development team and the organization:** Developers, in creating and maintaining email software, must interact with technology systems as well as other human systems.
- **Hardware:** Used along with software by developers and ultimately by end-users.
- **Software:** Uses hardware and is created by and maintained by developers and other teams within the company. End-users of the software also interact with it.
- **Users:** Interacting with and influencing the other systems through their behaviors as customers and consumers, users are another critical part of an email STS.
- When you elevate the entire sociotechnical system over managing your business in disparate parts, it's easier to grow and respond to change. Sociotechnical systems are an effective way to bring technology and people together while managing risks and improving the human experience of today's technologies.

Benefits for organizations

- Easy management of sophisticated human challenges:
  - the system's ability to manage human relationships allows organizations to respond more effectively

- Self-regulation and error detection:
  - With a flat hierarchy and responsive structure, teams inside an STS can quickly recognize problems and deploy resources to resolve them.

- Trust and responsibility:
  - Since groups are autonomous, they can take responsibility for fixing problems and can supervise the process from start to finish. By design, teams are trusted to do their work effectively.

DISADVANTAGES

- Limited systems understanding and blind spots:
  - A poor understanding of how different layers interact may increase your organization's risk of accidents, result in a less effective response to environmental changes, or other issues.

- Wrong or inaccurate information:
  - Good information is essential for business decision-making inside an STS. If the information is not precise enough to be helpful or contains inaccuracies, teams within the system are at risk of acting incorrectly based on the information they have.

- Human-machine challenges:
  - Given that the technical systems rely on human systems working with them as operators and users, errors can show up without an easily discovered cause or origin.
- Complexity that outgrows organizational design:
  - Some technologies and new systems created through STSs can themselves become too big or complex for their companies to manage. In such a situation, the organizational structure may need to adapt and change somewhat in response.
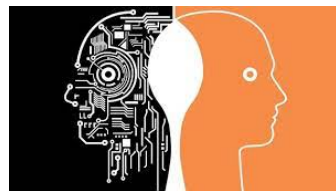
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- Less control:
  - Managers don't always have direct control over every aspect of a sociotechnical system.
  - For example, a company can't necessarily control how customers respond to a new rebranding or how an evolving regulatory environment will directly impact the long-term viability of their brand.

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END

THANK
YOU
FOR
YOUR
ATTENTION

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Information System Strategies

1

Information System Strategies for Dealing with Competitive Forces

- There are four generic strategies, each of which often is enabled by using information technology and systems:
    1. low-cost leadership
    2. product differentiation
    3. focus on market niche
    4. strengthening customer and supplier intimacy.

1. low-cost leadership

- Supermarkets and large retail stores such as Walmart use sales data captured at the checkout counter to determine which items have sold and need to be reordered. Walmart's continuous replenishment system transmits orders to restock directly to its suppliers.
- The system enables Walmart to keep costs low while fine-tuning its merchandise to meet customer demands.

low-cost leadership

What is Cost Leadership?
A company pursuing a Cost Leadership strategy aims to establish a competitive advantage by achieving the lowest operational costs in their sector.

- Use information systems to achieve the lowest operational costs and the lowest prices

- How can you establish a competitive advantage in costs?
    – High asset utilization
    – Low direct & indirect operating costs
    – Value chain control

activity

- Go through this web site and identify **the best real-world Cost Leadership examples** to help us understand the concept.
  - https://mktoolboxsuite.com/cost-leadership-examples/

2. Product differentiation

- Use information systems to enable new products and services or greatly change the customer convenience in using your existing products and services.
  - Eg: Google continuously introduces new and unique search services on its website, such as Google Maps.

activity

- Visit this site and identify how to make differentiation in each and every industry
  - https://mktoolboxsuite.com/differentiation-strategy-examples/

3. Niche market

- A niche market is the subset of the market on which a specific product is focused.
- The market niche defines the product features aimed at satisfying
  - Price (luxury, moderate, discount)
  - Demographics (gender, age, income level, education level)
  - Level of quality (premium, handmade, economical)
  - Psychographics (values, interests, attitudes)
  - Geographics (residents of a certain country, city, or even neighborhood)
- It is also a small market segment

Focus on Market Niche

- Use IS to enable a specific market focus and serve this narrow target market better than competitors.

niche markets and product idea

- Conscious consumers
  - consumers were willing to change their shopping habits to reduce environmental impact.
- The rise of the conscious consumer has paved the way for vegan, eco-friendly, and cruelty-free variations of conventional products.

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Bee's Wrap

- to replace plastic wrap with options made from beeswax. This natural alternative to food storage is not only environmentally friendly but also more cost effective for consumers because it's reusable.

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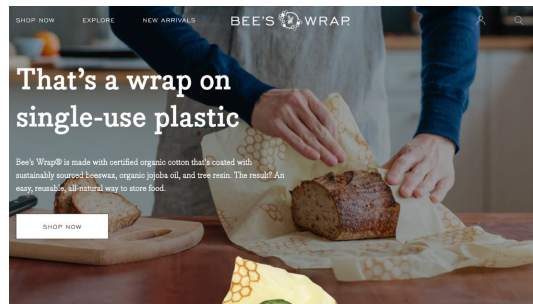
Focus on Market Niche ..

- Information systems support this strategy by producing and analyzing data for finely tuned sales and marketing techniques.
- Information systems enable companies to analyze
  - customer buying patterns
  - Tastes
  - preferences closely

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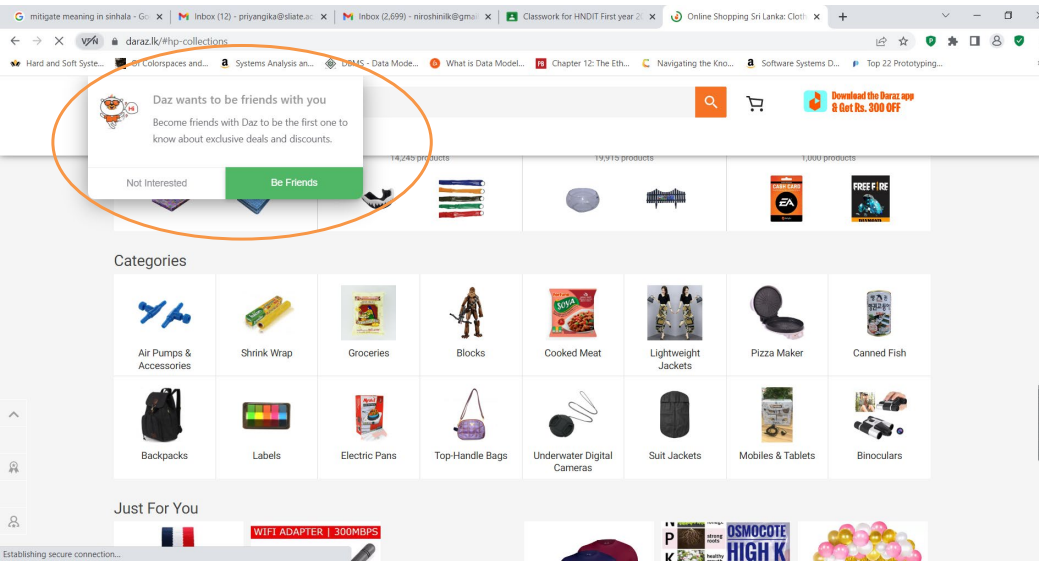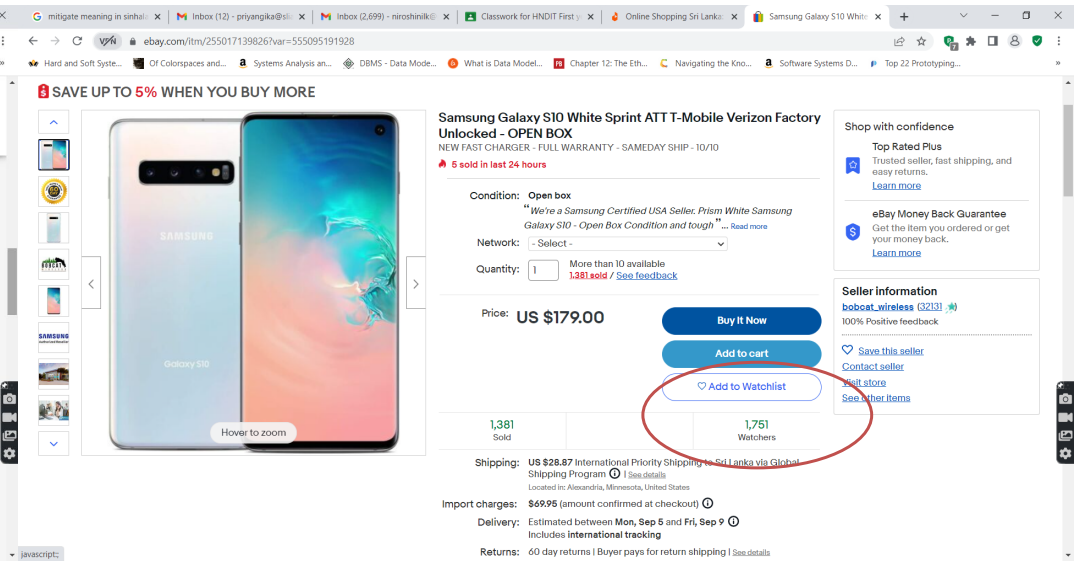
4. Strengthen Customer and Supplier Intimacy

- A business can also use information systems to apply the strategy of strengthening customer and supplier intimacy.

- This strategy creates strong linkage between the company and their suppliers and/or customers.

- It also increases loyalty to a business and creates stronger relationships.

- Customers and suppliers will feel more valued by the company as well.

example

TOYOTA

- .Toyota, along with other automobile companies, allows their suppliers access to production schedules.

- This makes it easier for suppliers to know when to ship parts and supplies without having to communicate back and forth about fulfilling orders.

- This strategy makes the production process run smoother and faster because the supplier can produce the goods they need and ship them to Toyota just in time for their production of the vehicles.

Amazon employs the customer intimacy strategy

- Amazon tracks their account users preferences and recommends certain products that customer may like based on their recent searches and purchases.
- Amazon also recommends products based on if another customer bought the same or a similar product to the user and what the other customer purchased with it. **amazon**

TABLE 3.4 FOUR BASIC COMPETITIVE STRATEGIES

STRATEGY	DESCRIPTION	EXAMPLE
Low-cost leadership	Use information systems to produce products and services at a lower price than competitors while enhancing quality and level of service	Walmart
Product differentiation	Use information systems to differentiate products, and enable new services and products	Uber, Nike, Apple
Focus on market niche	Use information systems to enable a focused strategy on a single market niche; specialize	Hilton Hotels, Harrah's
Customer and supplier intimacy	Use information systems to develop strong ties and loyalty with customers and suppliers	Toyota Corporation, Amazon

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STRATEGIC PLANNING PROCESS

What is Strategic Planning Process

- the method used by organizations to develop plans to achieve overall, long-term goals.
- it helps you create a roadmap for which strategic goals you should make an effort to achieve, and which initiatives are less useful to the business.
- Helping you understand your internal and external strategy.

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The process of strategic planning is the steps you take as an organization to determine:

- Your organization's management (Vision)
- What and for whom are you going to do (Mission)
- How to measure and guide your strategy towards where you want to be (Objectives)

Why?

- To get your team on the same page and align with the vision, mission, and goals of your organization;
- It is maximizing your organization's resources to avoid wasting time and money on unimportant projects or activities;
- To understand the trends and scenarios in the industry that might affect your organization in the coming years;
- To Develop an action schedule for keeping you and your staff on track and to be responsible for the outcomes

5 steps

Step 1: Clarify Your Strategic Position

- Considering both internal and external sources, get the right stakeholders involved right from the start.
- Identify main competitive issues by talking to the company's managers, collecting input from clients, and gathering business and consumer data to get a better view of the market and customer role.

SWOT Analysis of Apple

STRENGTH	WEAKNESS	OPPORTUNITIES	THREATS
• Most Valuable Brand • Globally Iconic • Top Technology • Proficient Research • Expansion in Services	• Product Cost • Limited Promotions • Entering non-competency area • Limitations with other software	• Qualified Professionals • Lack of Green Technology • Smart Wearable Tech • Utlize AI	• Counterfeits • Increasing Competition • Market Penetration • Different Lawsuits

S   W   O   T

2. Prioritize Your Objectives

- After the current market position has been established, objectives that will help meet expectations. Specific objectives will be in accordance with the mission and direction of the organization

Step 3: Formulate A Strategy

- This phase involves identifying the strategies required to accomplish the goals and mapping out a schedule and effective communication of responsibilities.

Step 4: Implement and Manage The Strategy

- Effective implementation of the strategy is key to the growth of the business enterprise. This phase is the action stage for the strategic management process. In case the cumulative strategy does not work with the existing operations of the business, a new structure and strategy should be installed at the beginning of this phase.

Step 5: Monitor and Evaluate Strategy

- The strategic plans and priorities will be checked and revised once a year to incorporate with new business adjustments, and ensure targets are based on the organization's constantly-changing environment.
- Strategy assessment and control actions include performance measurements, consistent review of internal and external issues and, where necessary, corrective actions. Any successful strategic evaluation starts with the definition of the parameters to be measured.

Examples of Strategic Planning Process

- This strategic planning diagram shows the procedure from understanding the goals and missions to analyze the strategic plan.

STRATEGIC PLANNING

Analyze and Access

Understanding of all the Goals and Vision

Information Gathering

Cooperation & Communication to increase the business

Strategies and Plan Understanding

Revision as per feedback after execution

Mapping Resources to implement the project

Measuring Progress

Scale and Sustain
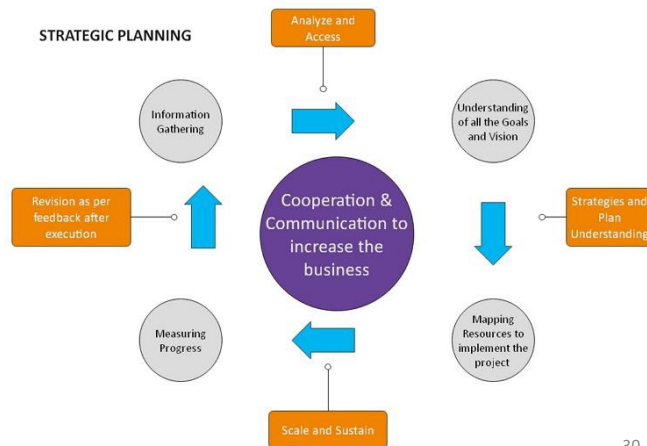
TABLE 3.5 IMPACT OF THE INTERNET ON COMPETITIVE FORCES AND INDUSTRY STRUCTURE

COMPETITIVE FORCE	IMPACT OF THE INTERNET
Substitute products or services	Enables new substitutes to emerge with new approaches to meeting needs and performing functions
Customers' bargaining power	Availability of global price and product information shifts bargaining power to customers
Suppliers' bargaining power	Procurement over the Internet tends to raise bargaining power over suppliers; suppliers can also benefit from reduced barriers to entry and from the elimination of distributors and other intermediaries standing between them and their users
Threat of new entrants	Internet reduces barriers to entry, such as the need for a sales force, access to channels, and physical assets; it provides a technology for driving business processes that makes other things easier to do
Positioning and rivalry among existing competitors	Widens the geographic market, increasing the number of competitors and reducing differences among competitors; makes it more difficult to sustain operational advantages; puts pressure to compete on price

Database and Information Management

END

An effective information system

- An effective information system provides users with accurate, timely, and relevant information.
- Accurate information is free of errors.
- Information is timely when it is available to decision makers when it is needed.
- Information is relevant when it is useful and appropriate for the types of work and decisions that require it.

File Organization

- **A bit** represents the smallest unit of data a computer can handle.
- A group of bits, called a **byte**, represents a single character, which can be a letter, a number, or another symbol.
- A grouping of characters into a word, a group of words, or a complete number (such as a person's name or age) is called a **field**.
- A group of related fields comprises a **record**;
- a group of records of the same type is called **a file** .
- A group of related files makes up **a database**.

FIGURE 6.1   THE DATA HIERARCHY
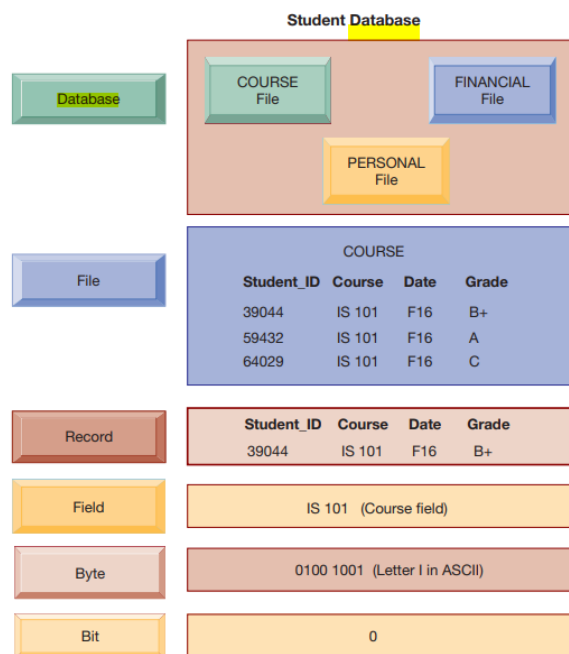
Database Concepts

- An **entity** is a person, place, thing, or event on which we store and maintain information.
- Each characteristic or quality describing a particular entity is called an **attribute.**
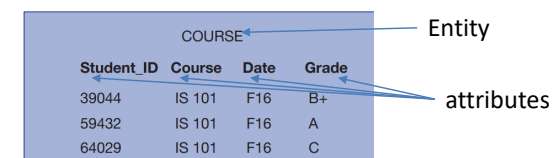
FIGURE 6.2 TRADITIONAL FILE PROCESSING
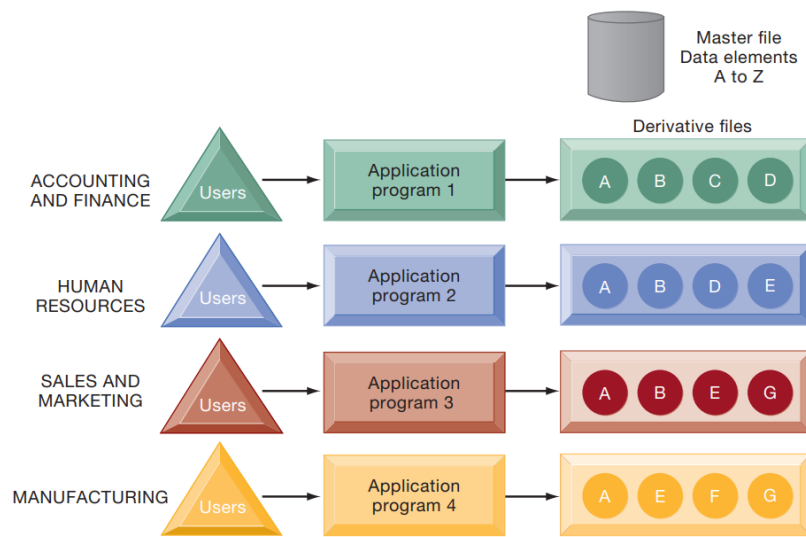
The use of a traditional approach to file processing encourages each functional area in a corporation

Problems with the Traditional File

1. data redundancy and inconsistency
2. program-data dependence
3. inflexibility
4. poor data security
5. an inability to share data among applications.

1. Data Redundancy and Inconsistency Data

- **Data redundancy** presence of duplicate data in multiple data files so that the same data are stored in more than one place or location.

- Data redundancy wastes storage resources and also leads to data **inconsistency**, where the same attribute may have different values.

example

Emp_code	Emp_name	Emp_experience	Dept_id	Dep_manager
emp001	K.Saman	2	Dep22	Ranil
emp002	R.Sunil	5	Dep18	Sunil
emp003	N. Shafeen	3	Dep17	Anil
emp004	P.Kumara	1	Dep_22	Ranil
emp005	R.Perera	4	Dep18	Sunil
emp006	S.Gamage	2	Dep19	Malki

same data are stored in more than one place or location

same attribute may have different values

Inventory

Item_ID	Item	Stock
39044	IS101	Extra Large
59435	IS102	Small

FactoryStock

ItemID	Name	Size
39044	Shirt	XL
59435	Short	S

the sales, inventory, and manufacturing systems of a clothing retailer might use different codes to represent clothing size. One system might represent clothing size as "extra large," whereas another might use the code "XL" for the same purpose.

10

2. Program-Data Dependence

- Program-data dependence refers to the coupling of data stored in files and the specific programs required to update and maintain those files such that changes in programs require changes to the data.

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3. Lack of Flexibility

- A traditional file system can deliver routine scheduled reports after extensive programming efforts, but it cannot deliver ad hoc reports or respond to unanticipated information requirements in a timely fashion.

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4. Poor Security

- Because there is little control or management of data, access to and dissemination of information may be out of control.
- Management may have no way of knowing who is accessing or even making changes to the organization's data.

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5. Lack of Data Sharing and Availability

- Because pieces of information in different files and different parts of the organization cannot be related to one another, it is virtually impossible for information to be shared or accessed in a timely manner.
- Information cannot flow freely across different functional areas or different parts of the organization.

A database management system (DBMS)

- A database management system (DBMS) is a software designed to define, manipulate, retrieve and manage data in a centralized database
  - The DBMS acts as an interface between application programs and the physical data files.
  - When the application program calls for a data item, such as gross pay, the DBMS finds this item in the database and presents it to the application program.

FIGURE 6.3 HUMAN RESOURCES DATABASE WITH MULTIPLE VIEWS
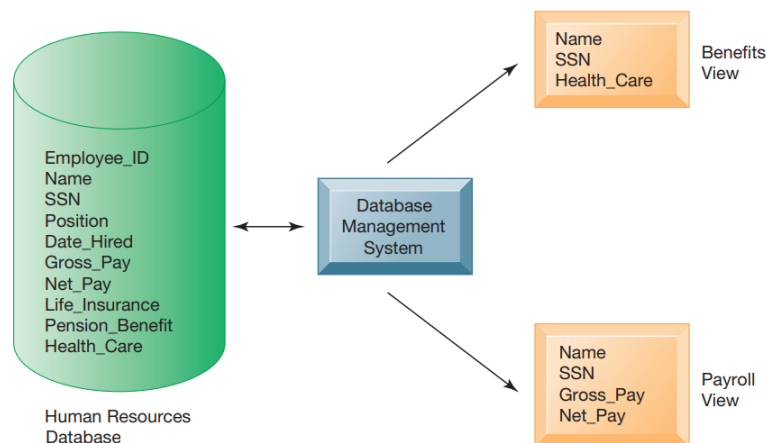
A single human resources database provides many different views of data, depending on the information requirements of the user. Illustrated here are two possible views, one of interest to a benefits specialist and one of interest to a member of the company's payroll department.

How a DBMS Solves the Problems of the Traditional File Environment

- A DBMS reduces data redundancy and inconsistency by minimizing isolated files in which the same data are repeated.
- Even if the organization maintains some redundant data, using a DBMS eliminates data inconsistency because the DBMS can help the organization ensure that every occurrence of redundant data has the same values.

example

Employee dept

Emp_code	Emp_name	Emp_experience	Dept_id	Dep_manager
emp001	K.Saman	2	Dep22	Ranil
emp002	R.Sunil	5	Dep18	Sunil
emp003	N. Shafeen	3	Dep17	Anil
emp004	P.Kumara	1	Dep_22	Ranil
emp005	R.Perera	4	Dep18	Sunil
emp006	S.Gamage	2	Dep19	Malki

Employee

Emp_code	Emp_name	Emp_experience
emp001	K.Saman	2
emp002	R.Sunil	5
emp003	N. Shafeen	3
emp004	P.Kumara	1
emp005	R.Perera	4
emp006	S.Gamage	2

Department

Dept_id	Department
Dep22	Math's
Dep18	Science
Dep17	Economy
Dep19	English

Dept-_Mgt

Dept_id	Dep_manager
Dep22	Ranil
Dep18	Sunil
Dep17	Anil
Dep19	Malki

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- The DBMS uncouples programs and data, enabling data to stand on their own.

Access and availability of information will be increased and program development and maintenance costs reduced because users and programmers can perform ad hoc queries of the database for many simple applications without having to write complicated programs.

-
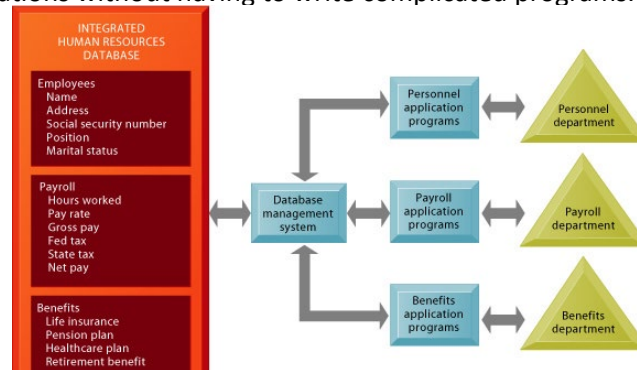
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- The DBMS enables the organization to centrally manage data, their use, and security.

- Data sharing throughout the organization is easier because the data are presented to users as being in a single location rather than fragmented in many different systems and files.
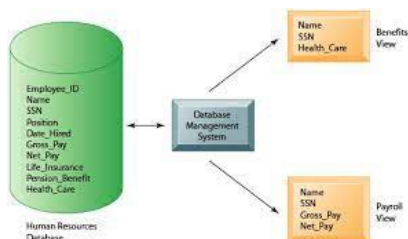
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Relational DBMS

- Relational databases represent data as two-dimensional tables (called relations).
- Tables may be referred to as files.
- Each table contains data on an entity and its attributes.
- Eg:
  - Microsoft Access- for desktop
  - DB2, Oracle Database, and Microsoft SQL Server are relational DBMS for large mainframes and midrange computers.
  - MySQL is a popular open source DBMS.

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FIGURE 6.4   RELATIONAL DATABASE TABLES

SUPPLIER

Columns (Attributes, Fields)

Supplier_Number	Supplier_Name	Supplier_Street	Supplier_City	Supplier_State	Supplier_Zip
8259	CBM Inc.	74 5th Avenue	Dayton	OH	45220
8261	B. R. Molds	1277 Gandolly Street	Cleveland	OH	49345
8263	Jackson Composites	8233 Micklin Street	Lexington	KY	56723
8444	Bryant Corporation	4315 Mill Drive	Rochester	NY	11344

Rows (Records, Tuples)

Key Field (Primary Key)

PART

Part_Number	Part_Name	Unit_Price	Supplier_Number
137	Door latch	22.00	8259
145	Side mirror	12.00	8444
150	Door molding	6.00	8263
152	Door lock	31.00	8259
155	Compressor	54.00	8261
178	Door handle	10.00	8259

Primary Key   Foreign Key

22

SUPPLIER(supplier_number, supplier_name, supplier_street, supplier_city, state, ZIP_ code)

- Each table consists of a grid of columns and rows of data.
- Each individual element of data for each entity is stored as a separate field, and each field represents an **attribute** for that entity.

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Related terms to Relational database

Tuples
- The actual information about a single supplier that resides in a table is called a row.
- Rows are commonly referred to as records, or in very technical terms, as **tuples** .

key field
- The field for Supplier_Number in the SUPPLIER table uniquely identifies each record so that the record can be retrieved, updated, or sorted. It is called a key field.

Primary key
- Each table in a relational database has one field that is designated as its primary key. This key field is the unique identifier for all the information in any row of the table and this **primary key** cannot be duplicated.

foreign key
- An attribute in a relation of a database that serves as the primary key of another relation in the same database

Domain
- **Domain** refers to all the values which a data element may contain.

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Capabilities of Database Management Systems

- A DBMS includes capabilities and tools for organizing, managing, and accessing the data in the database.
- The most important are its data definition language, data dictionary, and data manipulation language.

data definition capability

- DBMS have a data definition capability to specify the structure of the content of the database.
- It would be used to create database tables and to define the characteristics of the fields in each table.
- This information about the database would be documented in a data dictionary.
- A **data dictionary** is an automated or manual file that stores definitions of data elements and their characteristics

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Sample data dictionary report

- The sample data dictionary report for a human resources database provides helpful information, such as the size of the data element, which programs and reports use it, and which group in the organization is the owner responsible for maintaining it. The report also shows some of the other names that the organization uses for this piece of data.

```
NAME: AMT-PAY-BASE
FOCUS NAME: BASEPAY
PC NAME: SALARY

DESCRIPTION: EMPLOYEE'S ANNUAL SALARY

SIZE: 9 BYTES
TYPE: N (NUMERIC)
DATE CHANGED: 01/01/04
OWNERSHIP: COMPENSATION
UPDATE SECURITY: SITE PERSONNEL
ACCESS SECURITY: MANAGER, COMPENSATION PLANNING AND RESEARCH
                 MANAGER, JOB EVALUATION SYSTEMS
                 MANAGER, HUMAN RESOURCES PLANNING
                 MANAGER, SITE EQUAL OPPORTUNITY AFFAIRS
                 MANAGER, SITE BENEFITS
                 MANAGER, CLAIMS PAYING SYSTEMS
                 MANAGER, QUALIFIED PLANS
                 MANAGER, SITE EMPLOYMENT/EEO
BUSINESS FUNCTIONS USED BY: COMPENSATION
                 HR PLANNING
                 EMPLOYMENT
                 INSURANCE
                 PENSION
                 401K

PROGRAMS USING:  PI01000
                 PI02000
                 PI03000
                 PI04000
                 PI05000

REPORTS USING:    REPORT 124 (SALARY INCREASE TRACKING REPORT)
                  REPORT 448 (GROUP INSURANCE AUDIT REPORT)
                  REPORT 452 (SALARY REVIEW LISTING)
                  PENSION REFERENCE LISTING
```

ACCESS DATA DICTIONARY FEATURES

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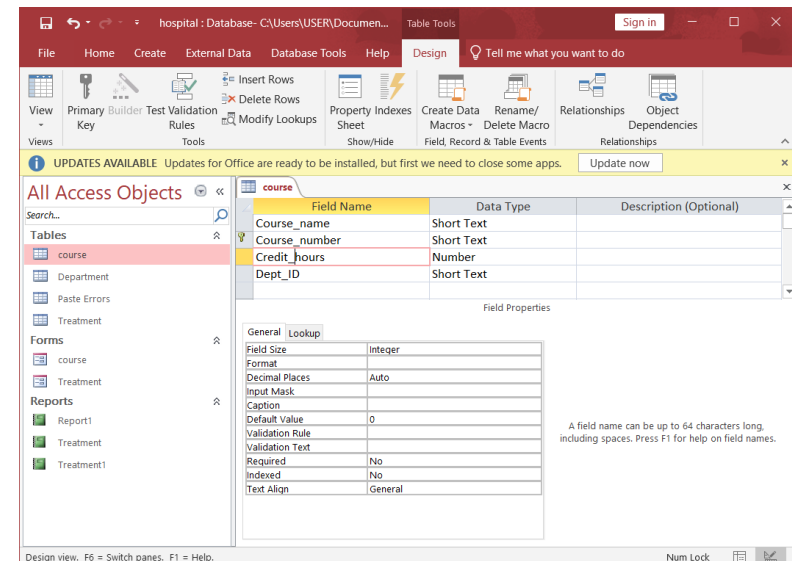
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Data Manipulation

- DBMS includes tools for accessing and manipulating information in databases.
- Most DBMS have a specialized language called a data manipulation language that is used to add, change, delete, and retrieve the data in the database.
- The most prominent data manipulation language today is Structured Query Language, or SQL.

PRACTICAL WITH ACCESS

Normalization

- Normalization is the process of organizing data in a database.
- This includes creating tables and establishing relationships between those tables according to rules designed both to protect the data and to make the database more flexible by eliminating redundancy and inconsistent dependency.

- The conceptual database design describes how the data elements in the database are to be grouped.
- The design process identifies relationships among data elements and the most efficient way of grouping data elements together to meet business information requirements.
- Groups of data are organized, refined, and streamlined until an overall logical view of the relationships among all the data in the database emerges.
- To use a relational database model effectively, complex groupings of data must be streamlined to minimize redundant data elements and difficult many-to -many relationships.
- The process of creating small, stable, yet flexible and adaptive data structures from complex groups of data is called normalization .

FIGURE 6.10 NORMALIZED TABLES CREATED FROM ORDER

FIGURE 6.9 AN UNNORMALIZED RELATION FOR ORDER

ORDER (Before Normalization)

Order_Number	Order_Date	Part_Number	Part_Name	Unit_Price	Part_Quantity	Supplier_Number	Supplier_Name	Supplier_Street	Supplier_City	Supplier_State	Supplier_Zip

An unnormalized relation contains repeating groups. For example, there can be many parts and suppliers for each order. There is only a one-to-one correspondence between Order_Number and Order_Date.

FIGURE 6.10 NORMALIZED TABLES CREATED FROM ORDER

PART

Part_Number	Part_Name	Unit_Price	Supplier_Number

Key

LINE ITEM

Order_Number	Part_Number	Part_Quantity

Key

SUPPLIER

Supplier_Number	Supplier_Name	Supplier_Street	Supplier_City	Supplier_State	Supplier_Zip

Key

ORDER

Order_Number	Order_Date

Key

After normalization, the original relation ORDER has been broken down into four smaller relations. The relation ORDER is left with only two attributes, and the relation LINE_ITEM has a combined, or concatenated, key consisting of Order_Number and Part_Number.

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Entity relationship Diagram

- This diagram illustrates the relationship between the entities SUPPLER, PART, LINE_ITEM, and ORDER.
- The boxes represent entities.
- The lines connecting the boxes represent relationships.
- A line connecting two entities that ends in two short marks designates a one-to-one relationship.
- A line connecting two entities that ends with a crow's foot topped by a short mark indicates a one-to-many relationship.

FIGURE 6.11 AN ENTITY-RELATIONSHIP DIAGRAM

SUPPLIER	provides / is supplied by	PART	is ordered / contains	LINE_ITEM	belongs to / includes	ORDER
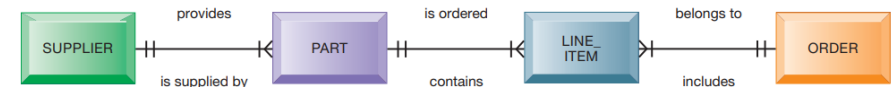
This diagram shows the relationships between the entities SUPPLIER, PART, LINE_ITEM, and ORDER that might be used to model the database in Figure 6.10.

- one ORDER can contain many LINE_ITEMs

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example

- If the business doesn't get its data model right, the system won't be able to serve the business well.
- The company's systems will not be as effective as they could be because they'll have to work with data that may be inaccurate, incomplete, or difficult to retrieve.

- Famous Footwear, a shoe store chain with more than 800 locations in 49 states, could not achieve its goal of having "the right style of shoe in the right store for sale at the right price" because its database was not properly designed for rapidly adjusting store inventory.

- The company had an Oracle relational database running on a midrange computer, but the database was designed primarily for producing standard reports for management rather than for reacting to marketplace changes.
- Management could not obtain precise data on specific items in inventory in each of its stores.
- The company had to work around this problem by building a new database where the sales and inventory data could be better organized for analysis and inventory management.

Database and Information Management

part2

Non-relational cloud databases

- **Non-relational cloud databases** store and manage unstructured data, such as email and mobile message text, documents, surveys, rich media files, and sensor data.
- They don't follow a clearly-defined schema like relational databases and allow you to save and organize information regardless of its format.

Non-relational database management systems

- Use a more flexible data model
- Designed for managing large data sets across many distributed machines and for easily scaling up or down.
- Useful for accelerating simple queries against large volumes of structured and unstructured data, including web, social media ect.

3

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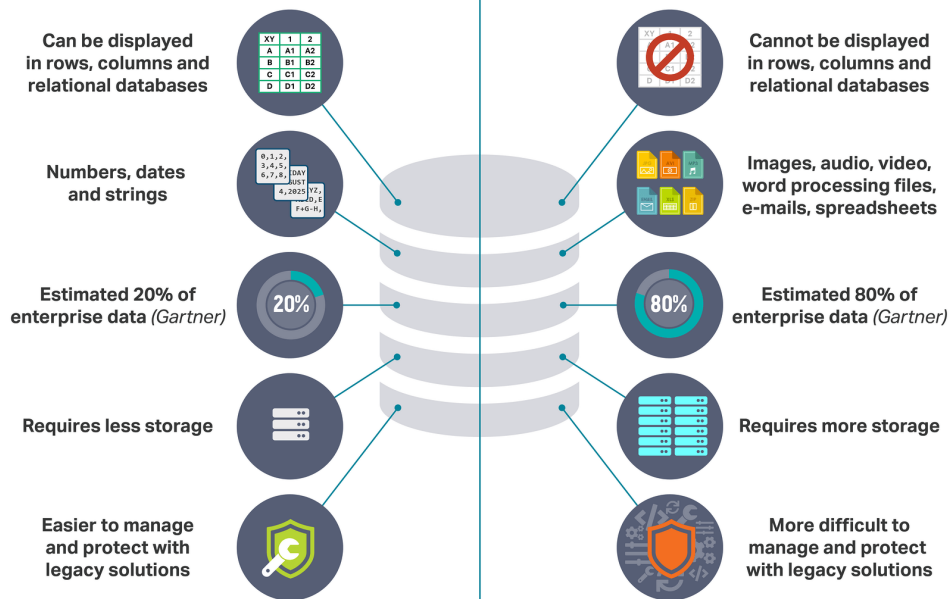
Need of non-relational database

- Cloud computing
- unprecedented data volumes
- massive workloads for web services
- Need to store new types of data require database

6

Cloud database

- A cloud database is a database built to run in a public or hybrid cloud environment to help organize, store, and manage data within an organization. Cloud databases can be offered as a managed database-as-a-service (DBaaS)
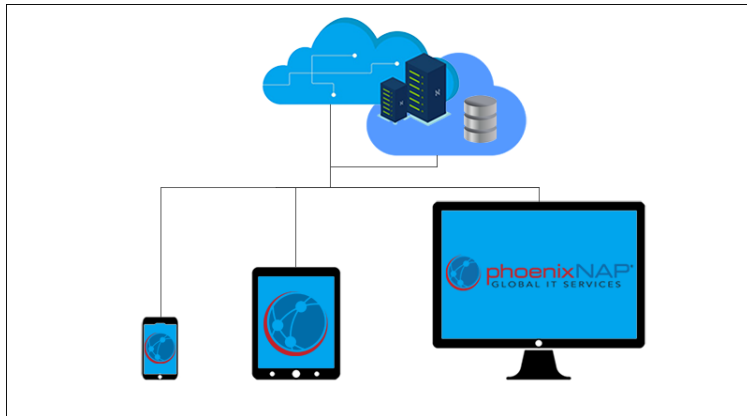
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NoSQL database

NoSQL databases are non-tabular databases and store data differently than relational tables. NoSQL databases come in a variety of types based on their data model.

- Oracle NoSQL database
- MongoDB, Redis, Cassandra, Hbase, and Cloud Bigtable
- Amazon's SimpleDB

Data set using MongoDB


```
{
    "_id": 1,
    "first_name": "Leslie",
    "last_name": "Yepp",
    "cell": "8125552344",
    "city": "Pawnee",
    "hobbies": ["scrapbooking", "eating waffles", "working"]
}
```

8

News article

MariaDB Launches New Database-as-a-Service, Partners with Google Cloud

By John K. Waters ■ April 2, 2020

MariaDB has launched a new database-as-a-service (DBaaS) this week called SkySQL, which it's billing as the first to provide a "MariaDB in the cloud" experience.

The company behind the popular open source relational database management system (DBMS) also announced a technical partnership with Google Cloud to make SkySQL available on the Google Cloud Platform (GCP).

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Amazon Cloud Databases

- Amazon and other cloud computing vendors provide relational database services as well.
- Amazon Relational Database Service (Amazon RDS) offers MySQL, SQL Server, Oracle Database, PostgreSQL, MariaDB, or Amazon Aurora DB (compatible with MySQL) as database engines.
- Pricing is based on usage.

11

12

- **Oracle** has its own Database Cloud Services using its relational Oracle Database
- **Microsoft Windows** SQL Azure Database is a cloud-based relational database service based on Microsoft's SQL Server DBMS.

Advantages of Cloud Database

- Special appeal for web-focused start-ups or small to medium-sized businesses seeking database capabilities at a lower price than in-house database products.
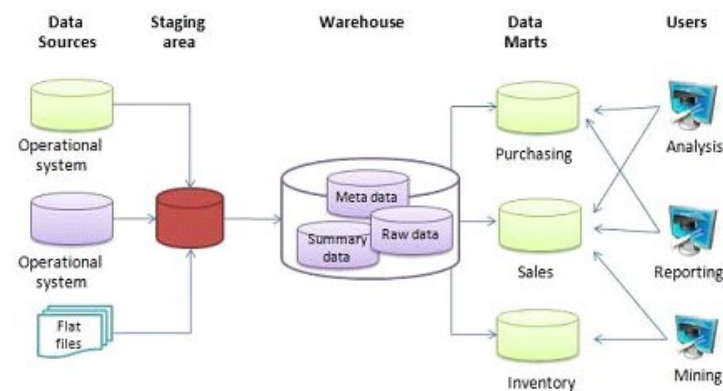

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What are the principal tools and technologies for accessing information from databases to improve business performance and decision making?

1.Data Warehouses

- A data warehouse is a database that stores current and historical data of potential interest to decision makers throughout the company.

Data warehouse..

- The data warehouse makes the data available for anyone to access as needed, but the data cannot be altered.

- A data warehouse system also provides a range of ad hoc and standardized query tools, analytical tools, and graphical reporting facilities.

2.Data Marts

- A data mart is a subset of a data warehouse in which a summarized or highly focused portion of the organization's data is placed in a separate database for a specific population of users.
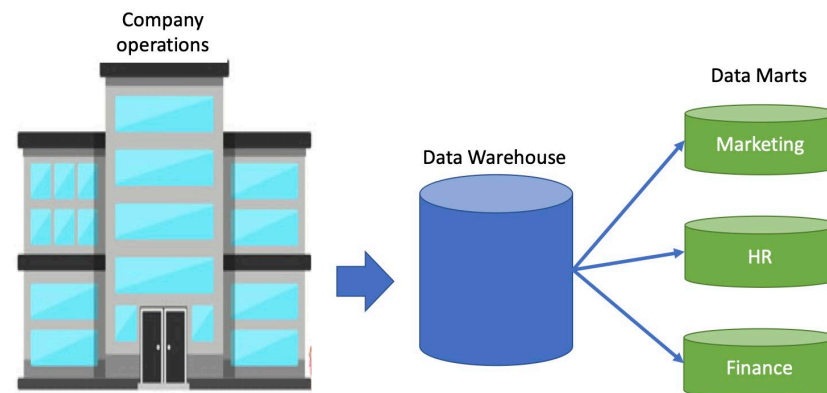
3.Hadoop

- Hadoop is an open source software framework managed by the Apache Software Foundation that enables distributed parallel processing of huge amounts of data across inexpensive computers.

Apache Hadoop

Hadoop…

- For handling unstructured and semi-structured data in vast quantities, as well as structured data, organizations are using Hadoop.

- It breaks a big data problem down into sub-problems, distributes them among up to thousands of inexpensive computer processing nodes, and then combines the result into a smaller data set that is easier to analyze.

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- Hadoop can process large quantities of any kind of data(Facebook and Twitter feeds, complex data such as web server log files, and unstructured audio and video data)

- Companies use Hadoop for analyzing very large volumes of data as well as for a staging before they are loaded into a data warehouse.

- Yahoo uses Hadoop to track users' behavior so it can modify its home page to fit their interests

4.In-Memory Computing

- Facilitating big data analysis is to use in-memory computing ,which relies primarily on a computer's main memory (RAM) for data storage.

- Users access data stored in system primary memory,.

- Dramatically shortening query response times.

- In-memory processing makes it possible for very large sets of data, amounting to the size of a data mart or small data warehouse, to reside entirely in memory.

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22

Analytic Platforms

- Analytic platforms such as IBM PureData System for Analytics, feature preconfigured hardware-software systems that are specifically designed for query processing and analytics.
  - For example, IBM PureData System for Analytics features tightly integrated database, server, and storage components that handle complex analytic queries 10 to 100 times faster than traditional systems.
- Analytic platforms include in-memory systems and NoSQL non-relational database management systems.
- Analytic platforms are now available as cloud services.

In-Memory Computing

- A new computing paradigm that performs both data storage and data computing in the memory network.
- High energy efficiency achieved based on reduced data movement between memory and processing unit.
- A promising technology to realize next-generation AI and neuromorphic computing.
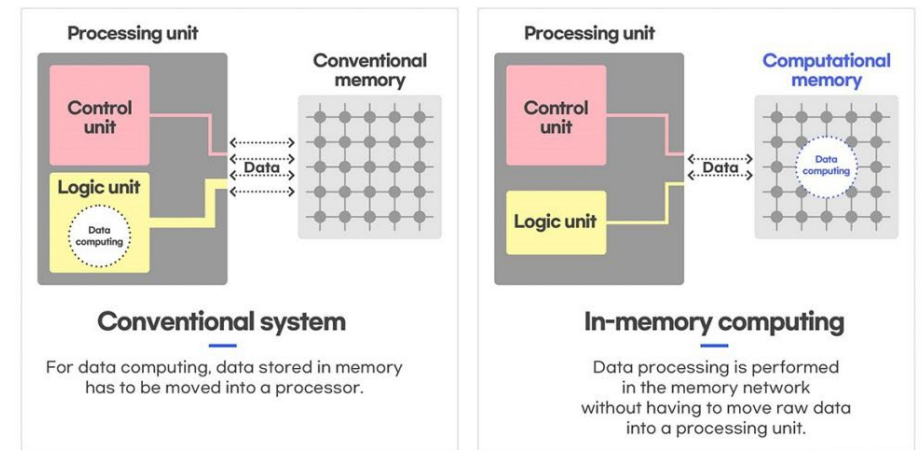
FIGURE 6.12 CONTEMPORARY BUSINESS INTELLIGENCE INFRASTRUCTURE
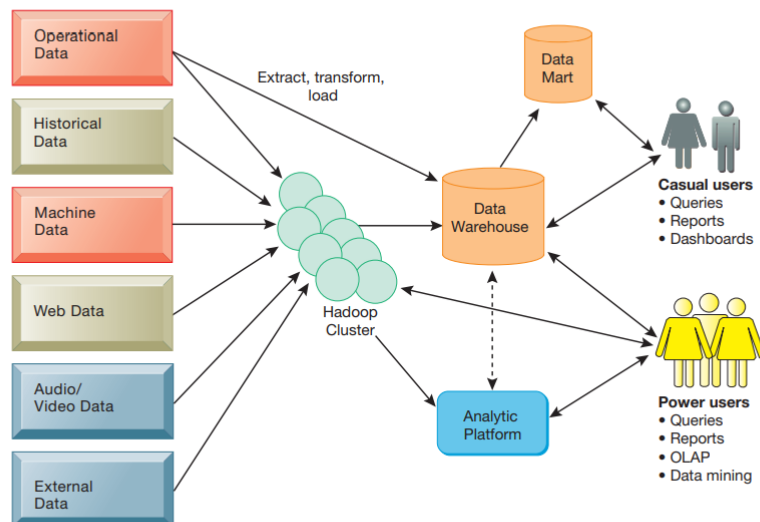
A contemporary business intelligence infrastructure features capabilities and tools to manage and analyze large quantities and different types of data from multiple sources. Easy-to-use query and reporting tools for casual business users and more sophisticated analytical toolsets for power users are included.

Analytical Tools: Relationships, Patterns, Trends

- Once data have been captured and organized using the business intelligence technologies we have just described, they are available for further analysis using software for database querying and reporting, multidimensional data analysis (Online Analytical Processing - OLAP), and data mining.

Online Analytical Processing (OLAP)

- Suppose your company sells four different products—nuts, bolts, washers, and screws—in the East, West, and Central regions.
- If you wanted to ask a fairly straightforward question, such as how many washers sold during the past quarter, you could easily find the answer by querying your sales database.
- But what if you wanted to know how many washers sold in each of your sales regions and compare actual results with projected sales? To obtain the answer, you would need online analytical processing (OLAP).
- OLAP supports multidimensional data analysis, enabling users to view the same data in different ways using multiple dimensions.
- OLAP enables users to obtain online answers to ad hoc questions.

Data mining

- **Data Mining** is a process of finding potentially useful patterns from huge data sets.
- The patterns and rules are used to guide decision making and forecast the effect of those decisions.

The types of information obtainable from data mining

- associations
- sequences
- classifications
- Clusters
- forecasts.

1. Associations

Associations are occurrences linked to a single event.

Eg: A study of supermarket purchasing patterns might reveal that,

- when corn chips are purchased, a cola drink is purchased 65 % of the time, but when there is a promotion, cola is purchased 85% of the time.
- This information helps managers make better decisions because they have learned the profitability of a promotion.

2. sequences

- In sequences events are linked over time.
  - If a house is purchased, a new refrigerator will be purchased within two weeks 65% of the time, and an oven will be bought within one month of the home purchase 45 % of the time.

Classification

- **Classification** recognizes patterns that describe the group to which an item belongs by examining existing items that have been classified and by supposing a set of rules.
  - For example, businesses such as credit card or telephone companies worry about the loss of steady customers.
  - Classification helps discover the characteristics of customers who are likely to leave
  - can provide a model to help managers predict who those customers are so that the managers can devise special campaigns to retain such customers.

Clustering

- **Clustering** works in a manner similar to classification when no groups have yet been defined.
- A data mining tool can discover different groupings within data,
  - Eg: finding affinity groups for bank cards or partitioning a database into groups of customers based on demographics and types of personal investments.

END

HNDIT1042 Information Management and Information Systems

Advanced Technological Institute
Galle

objectives

- Describe the issues of planning the development of computer-based applications
- Understand the need for control and maintenance of information systems

How does building new systems produce organizational change?

- Building a new information system is one kind of planned organizational change.
- The introduction of a new information system involves much more than new hardware and software. It also includes changes in jobs, skills, management, and organization.
- When we design a new information system, we are redesigning the organization.

Systems Development and Organizational Change

- Information technology can promote various degrees of organizational change, ranging from incremental to far-reaching
  - (1) automation
  - (2) rationalization
  - (3) business process redesign
  - (4) paradigm shifts

Automation

FIGURE 13.1 ORGANIZATIONAL CHANGE CARRIES RISKS AND REWARDS
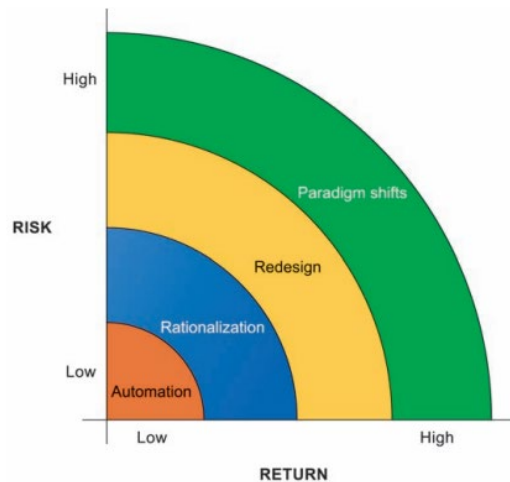
- The most common form of IT-enabled organizational change is automation .
- Information technology involved assisting employees with performing their tasks more efficiently and effectively.
- Eg: Calculating paychecks and payroll registers

Rationalization

- A deeper form of organizational change one that follows quickly from early automation—is rationalization of procedures.
- Rationalization of procedures is the streamlining of standard operating procedures.
  - For example, Angostura's new mobile order system is effective not only because it uses computer technology but also because the company simplified its business processes for this function. Fewer manual steps are required.

business process redesign

- A more powerful type of organizational change is business process redesign, in which business processes are analyzed, simplified, and redesigned.
- Business process redesign reorganizes workflows, combining steps to cut waste and eliminate repetitive, paper-intensive tasks.

Example for redesign

- Ford Motor Company's invoice less processing, which reduced head count in Ford's North American Accounts Payable organization of 500 people by 75%.
- Accounts payable clerks used to spend most of their time resolving discrepancies between purchase orders, receiving documents, and invoices.
- Ford redesigned its accounts payable process so that the purchasing department enters a purchase order into an online database that can be checked by the receiving department when the ordered items arrive.
- If the received goods match the purchase order, the system automatically generates a check for accounts payable to send to the vendor. There is no need for vendors to send invoices.

Paradigm shift

- Rationalizing procedures and redesigning business processes are limited to specific parts of a business.
- More radical form of business change is called a paradigm shift.
- A paradigm shift involves rethinking the nature of the business and the nature of the organization

Systems development

- Systems development is a structured kind of problem solved with distinct activities.
- These activities consist of systems analysis, systems design, programming, testing, conversion, and production and maintenance.

WHAT ARE THE CORE ACTIVITIES IN THE SYSTEMS DEVELOPMENT PROCESS?

Requirement Identification and system analysis

- Systems analysis is the analysis of a problem that a firm tries to solve with an information system. It consists of
  - defining the problem
  - identifying its causes
  - specifying the solution
  - identifying the information requirements
- The systems analyst then details the problems of existing systems. By
  - examining documents
  - work papers
  - procedures
  - observing system operations
  - interviewing key users of the systems

- the solution requires building a new information system or improving an existing one.
- The systems analysis also includes a feasibility study to determine whether that solution is feasible, or achievable, from a financial, technical, and organizational standpoint.
- The feasibility study determines whether the proposed system is expected to be a good investment.
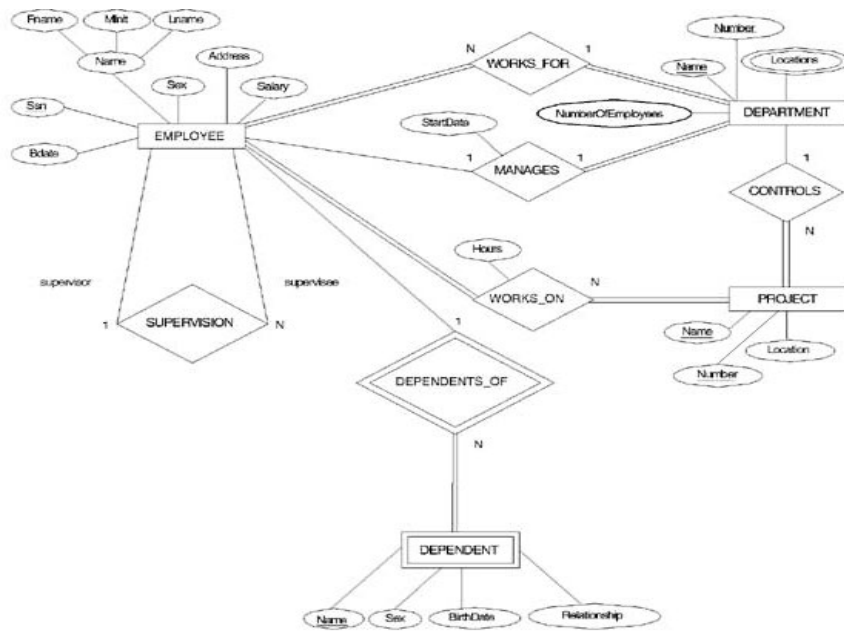
System design

- Systems design shows how the system will fulfill system objective.
- The design of an information system is the overall plan or model for that system.
- Each design represents a unique blend of technical and organizational components

- Data flow diagram
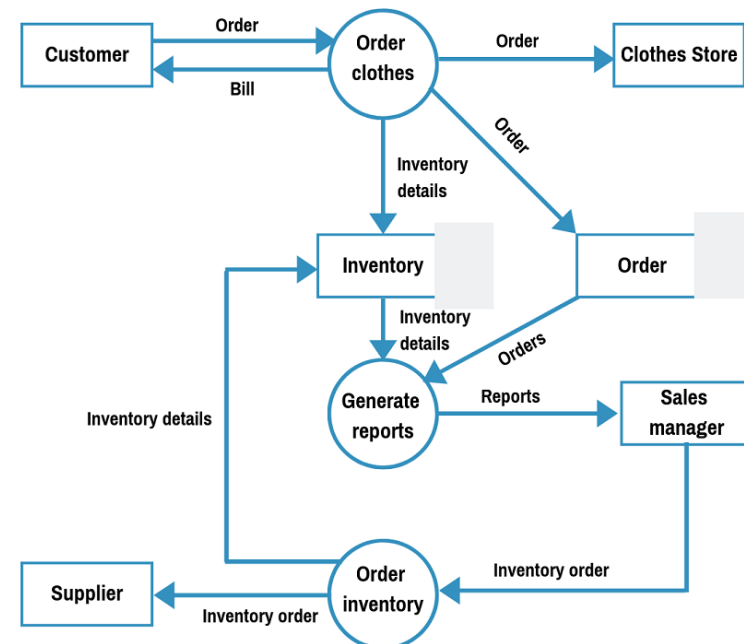
- ER diagram

coding

- During the coding(Programming) stage, system specifications that were prepared during the design stage are translated into software program code.
- Many organizations no longer do their own programming for new systems. Instead, they purchase the software that meets the requirements for a new system from external sources such as
  - software packages from a commercial software vendor
  - software services from a software service provider
  - outsourcing firms that develop custom application software for their clients.

Testing

- Thorough testing must be conducted to establish whether the system produces the right results.
- Testing an information system can be broken down into three types of activities:
  - unit testing
  - system testing
  - acceptance testing.

- Unit testing , or program testing, consists of testing each program separately in the system.
- System testing tests the functioning of the information system as a whole.
- Acceptance testing provides the final certification that the system is ready to be used in a production setting.

Conversion

- Conversion is the process of changing from the old system to the new system.

- Four main conversion strategies are
  - the parallel strategy
  - the direct cutover strategy
  - the pilot study strategy
  - the phased approach strategy.
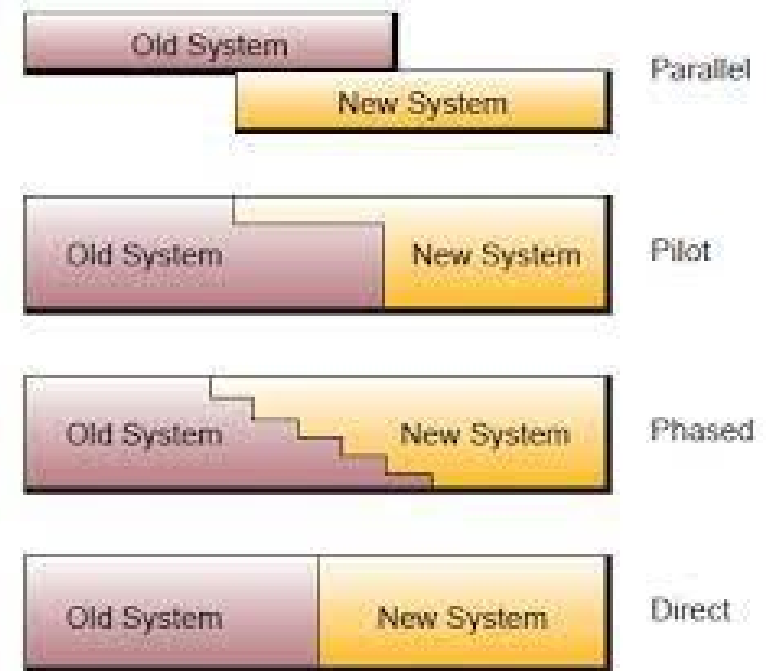
Production and Maintenance

- After the new system is installed and conversion is complete, the system is said to be in production.

- During this stage, the system will be reviewed by both users and technical specialists to determine how well it has met its original objectives and to decide whether any revisions or modifications are in order.

What are alternative methods for building information systems?

- The traditional systems life cycle

- Prototyping

- application software packages

- end-user development

- outsourcing.

The traditional systems life cycle

- The systems life cycle is still used for building large complex systems that require a formal requirements analysis predefined specifications, and tight controls over the system-building process.
- It can be costly, time-consuming, and inflexible.

FIGURE 13.9 THE TRADITIONAL SYSTEMS DEVELOPMENT LIFE CYCLE
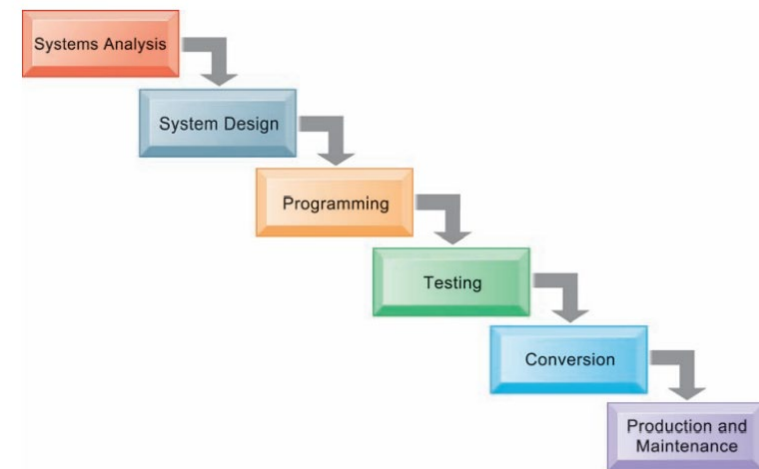
The systems development life cycle partitions systems development into formal stages, with each stage requiring completion before the next stage can begin.

Prototyping

- The prototype is a working version of an information system or part of the system, but it is meant to be only a preliminary model.
- Once operational, the prototype will be further refined until it conforms exactly to users' requirements.
- Once the design has been finalized, the prototype can be converted to a polished production system.
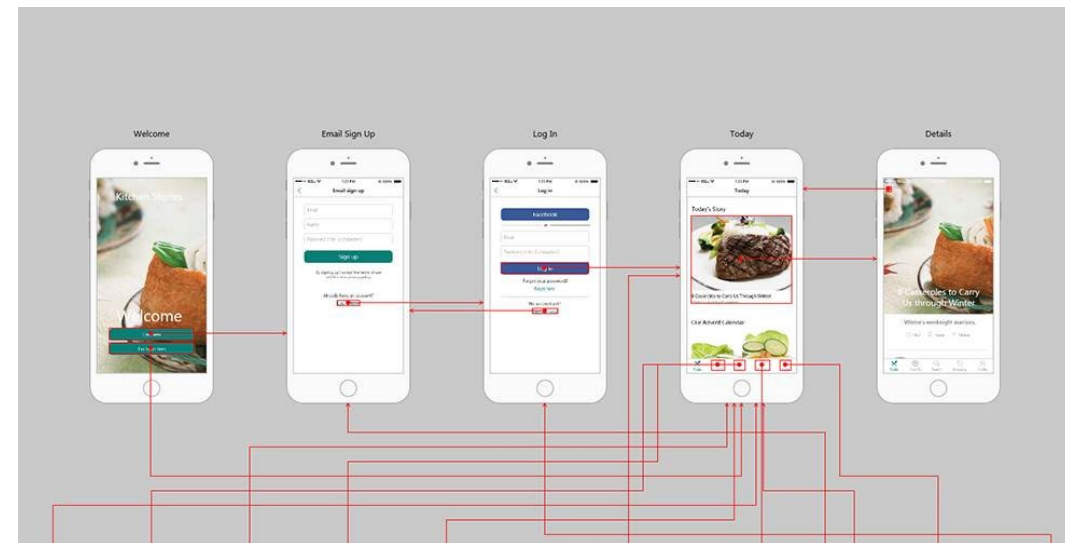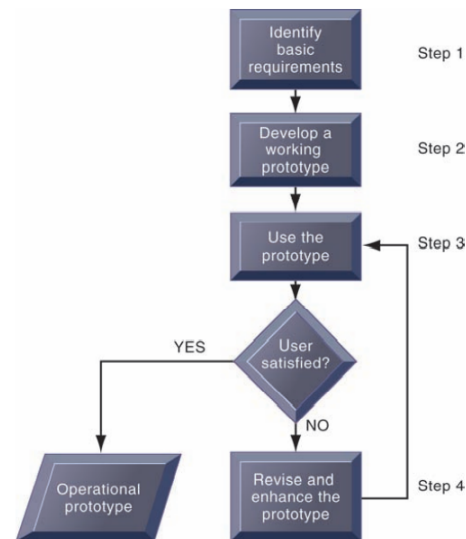
FIGURE 13.10 THE PROTOTYPING PROCESS

Identify basic requirements — Step 1
Develop a working prototype — Step 2
Use the prototype — Step 3
User satisfied?
YES → Operational prototype
NO → Revise and enhance the prototype — Step 4

The process of developing a prototype can be broken down into four steps. Because a prototype can be developed quickly and inexpensively, systems builders can go through several iterations, repeating steps 3 and 4, to refine and enhance the prototype before arriving at the final operational one.

- Prototyping is most useful when there is some uncertainty about requirements or design solutions and often used for designing an information system.

End-user development

- End-user development allows end users, with little or no formal assistance from technical specialists, to create simple information systems, reducing the time and steps required to produce a finished application.
- Using user-friendly query languages and reporting, website development, graphics, and PC software tools, end users can access data, create reports, and develop simple applications on their own with little or no help from professional systems analysts or programmers.

Application Software Packages and Cloud Software Services and outsourcing

- If a commercial software package or cloud software service can fulfill most of an organization's requirements, the company does not have to write its own software .

- The company can save time and money by using the prewritten, predesigned, pretested software programs from the software vendor.
- Package and SaaS vendors supply much of the ongoing maintenance and support for the system.

outsourcing

- A company could hire an external vendor to design and create the software for its system, but that company would operate the system on its own computers.
- The outsourcing vendor might be domestic or in another country.

What are new approaches for system building in the digital firm era?

- Rapid Application Development (RAD)
- Agile Development

Rapid application development (RAD)

- The term rapid application development (RAD) is used to describe this process of creating workable systems in a very short period of time with some flexibility to adapt as a project evolves.
- RAD also involves close teamwork among end users and information systems
- Simple systems often can be assembled from prebuilt components

joint application design (JAD)

- It is used to accelerate the generation of information requirements and to develop the initial systems design.
- JAD brings end users and information systems specialists together in an interactive session to discuss the system's design.
- Properly prepared and facilitated, JAD sessions can significantly speed up the design phase and involve users at an intense level.

Agile development

- Focuses on rapid delivery of working software by breaking a large project into a series of small subprojects that are completed in short periods of time using iteration and continuous feedback.
- Each mini-project is worked on by a team as if it were a complete project.
- Improvement or addition of new functionality takes place within the next iteration as developers clarify requirements.
- This helps to minimize the overall risk and allows the project to adapt to changes more quickly.
- Agile methods emphasize face-to-face communication over written documents, encouraging people to collaborate and make decisions quickly and effectively.

Securing Information Systems
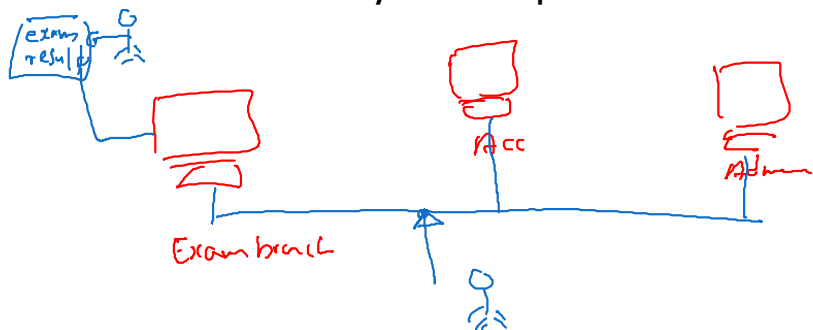
Why are information systems vulnerable to destruction, error, and abuse?

- if you operate a business today, you need to make security and control a top priority.
- Security refers to the policies, procedures, and technical measures used to prevent unauthorized access, alteration, theft, or physical damage to information systems.

Why Systems are Vulnerable

- The potential for unauthorized access, abuse, or fraud is not limited to a single location but can occur at any access point in the network.
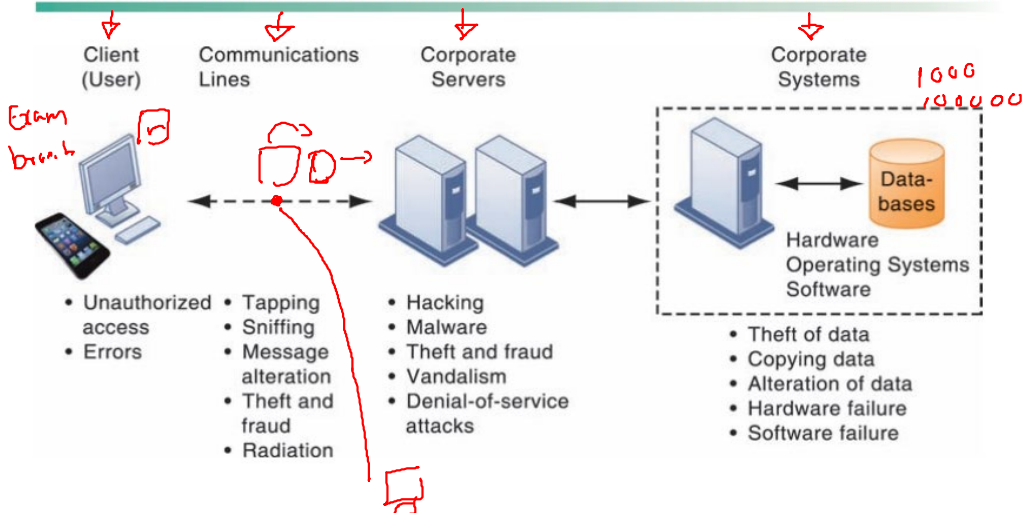
Types of malware

Ransomware

Spyware

Rootkit

Adware

Virus

Trojan horse

Remote access

Worm

Keylogger

FIGURE 8.1 CONTEMPORARY SECURITY CHALLENGES AND VULNERABILITIES

Client (User)

Communications Lines

Corporate Servers

Corporate Systems

Data-bases

Hardware Operating Systems Software

- Unauthorized access
- Errors

- Tapping
- Sniffing
- Message alteration
- Theft and fraud
- Radiation

- Hacking
- Malware
- Theft and fraud
- Vandalism
- Denial-of-service attacks

- Theft of data
- Copying data
- Alteration of data
- Hardware failure
- Software failure

Malicious software

- Malicious software programs are referred to as malware and include a variety of threats such as computer viruses, worms, and Trojan horses.

① Computer virus

- computer virus is a software program that attaches itself to other software programs or data files to be executed, usually without user knowledge or permission.

② worms

- which are independent computer programs that copy themselves from one computer to other computers over a network.
- Worms can operate on their own without attaching to other computer program files and rely less on human behavior to spread from computer to computer.
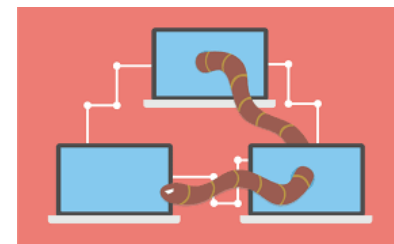
- Worms and viruses are often spread over the Internet
  – from files of downloaded software;
  – from files attached to e-mail transmissions;
  – from compromised e-mail messages
  – online ads
  – instant messaging.

③ Trojan horse

- A software program that appears to be benign but then does something other than expected.
- It is often a way for viruses or other malicious code to be introduced into a computer system.
- It is often used to steal login credentials for banking by surreptitiously capturing people's keystrokes as they use their computers.
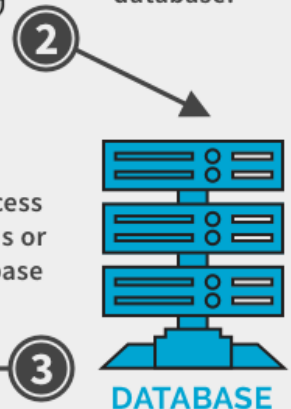
④ SQL injection

- These vulnerabilities occur when a web application fails to validate properly or filter data a user enters on a web page, which might occur when ordering something online.
- An attacker uses this input validation error to send a rogue SQL query to the underlying database to access the database, plant malicious code, or access other systems on the network.

SQL Injection Attack (SQLi)

1. Hacker identifies vulnerable, SQL-driven website & injects malicious SQL query via input data.

Username
Password

2. Malicious SQL query is validated & command is executed by database.

① **WEBSITE INPUT FIELDS** ②

3. Hacker is granted access to view and alter records or potentially act as database administrator.

HACKER ③ **DATABASE**

(5) spyware

- Spyware is loosely defined as **malicious software** designed to enter your computer device, gather data about you, and forward it to a third-party without your consent.
- Spyware can also refer to legitimate software that monitors your data for commercial purposes like advertising.

EXAMPLES OF SPYWARE

spyware creators evolved their software to capture the screen

Hackers and computer crime

- A hacker is an individual who intends to gain unauthorized access to a computer system.
- Hackers gain unauthorized access by finding weaknesses in the security protections websites and computer systems employ, often taking advantage of various features of the Internet that make it an open system and easy to use.
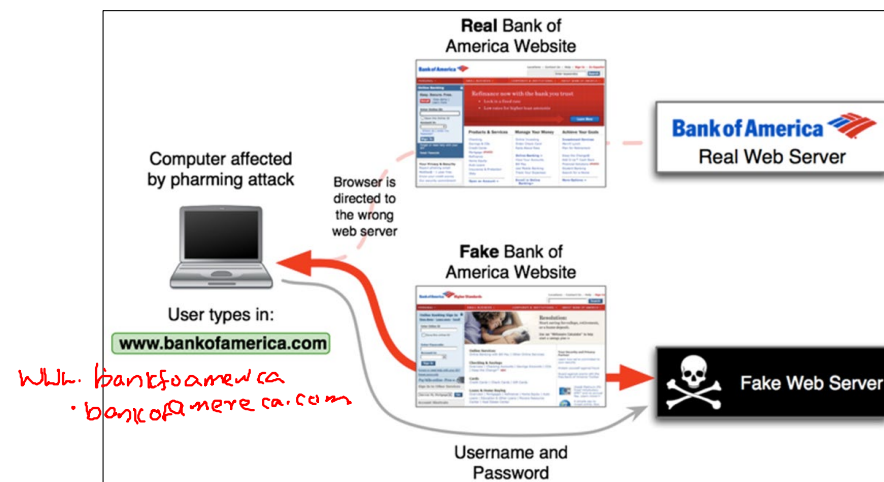
Spoofing and sniffing

- Hackers attempting to hide their true identities often spoof, or misrepresent, themselves by using fake e-mail addresses
- Spoofing may also involve redirecting a web link to an address different from the intended one,
  - For example, if hackers redirect customers to a fake website that looks almost exactly like the true site, they can then collect and process orders, effectively stealing business as well as sensitive customer information from the true site

John Doe
From: AnyBank
Sent: Friday, June 23, 2017 11:40 AM
To: Joseph Purser
Subject: Office 365 Signatures

From : google techinical support

u.N : ----
Pstwi: D.O.B — }
                 Fume —
Men - P.Sc -

Real Bank of America Website

Bank of America
Real Web Server

Computer affected by pharming attack

Browser is directed to the wrong web server

Fake Bank of America Website

User types in:
www.bankofamerica.com

Fake Web Server

www. banksoamerica
· bankofamereca.com

Username and Password
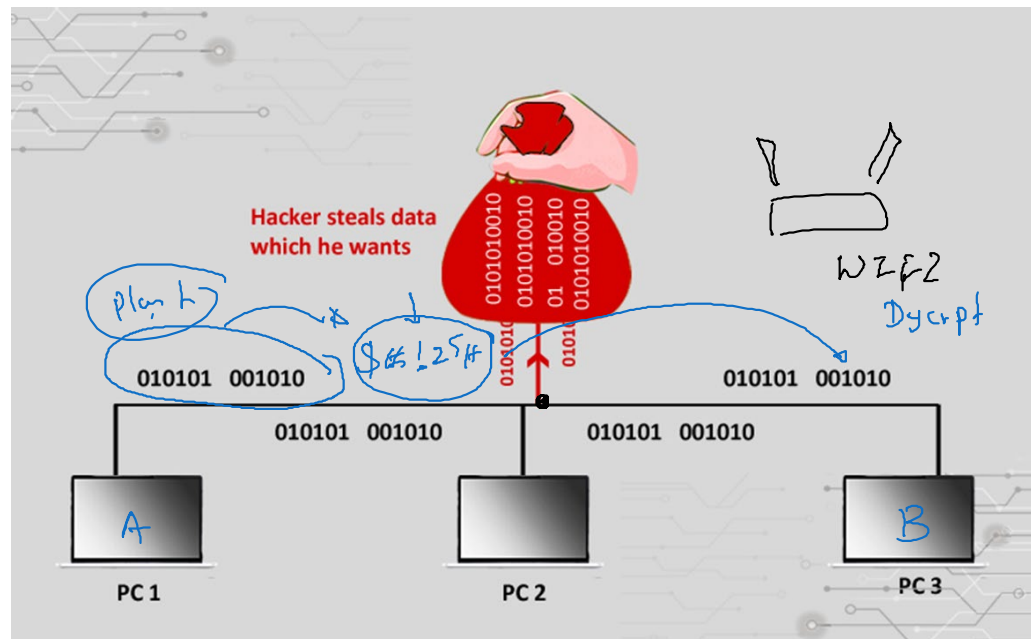
WWW.facebook.com

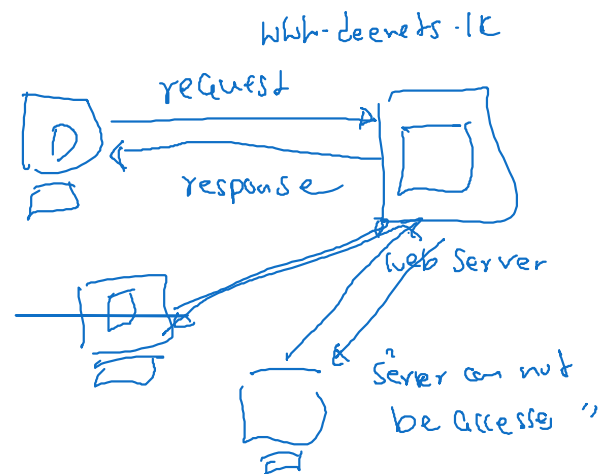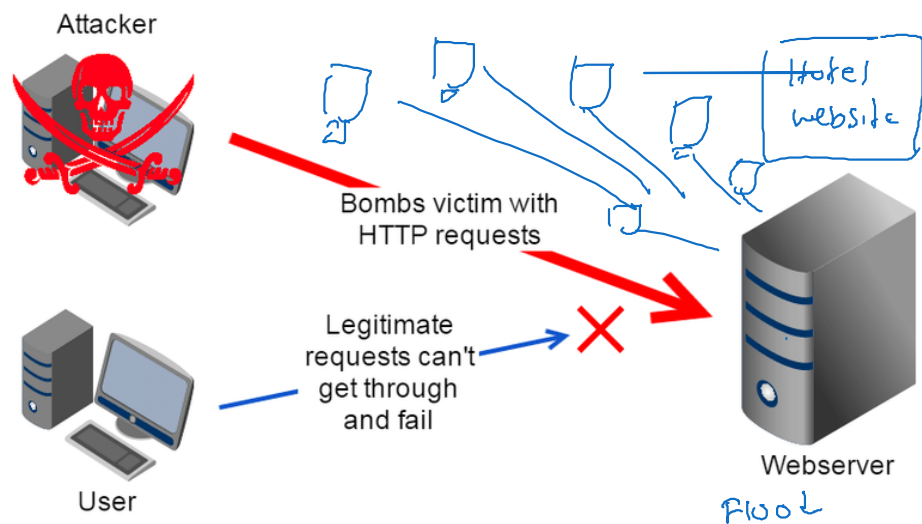www.facebok.com

- facebuoke.coms

- A sniffer is a type of eavesdropping program that monitors information traveling over a network.
- sniffers help identify potential network trouble spots or criminal activity on networks, but when used for criminal purposes, they can be damaging and very difficult to detect.
- Sniffers enable hackers to steal proprietary information from anywhere on a network, including e-mail messages, company files, and confidential rep

Denial-of-Service

- Denial-of-Service Attacks In a denial-of-service (DoS) attack, hackers flood a network server or web server with many thousands of false communications or requests for services to crash the network.
- The network receives so many queries that it cannot keep up with them and is thus unavailable to service legitimate requests. A distributed denial-of-service (DDoS) attack uses numerous computers to inundate and overwhelm the network from numerous launch points.

Attacker

Bombs victim with
HTTP requests

Legitimate
requests can't
get through
and fail

User

Webserver

Flood

Hotel
website

www-deenets.lk

request

response

web server

Server can not
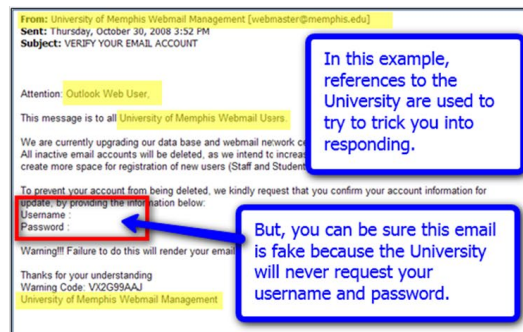be accessed

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Kamal → Si Kamal ## Identity Theft

- With the growth of the Internet and electronic commerce, identity theft has become especially troubling.
- Identity theft is a crime in which an imposter obtains key pieces of personal information, such as social security numbers, driver's license numbers, or credit card numbers, to impersonate someone else.
- The information may be used to obtain credit, merchandise, or services in the name of the victim or to provide the thief with false credentials.

phishing

- One increasingly popular tactic is a form of spoofing called phishing.
- Phishing involves setting up fake websites or sending e-mail messages that look like those of legitimate businesses to ask users for confidential personal data.
- The e-mail message instructs recipients to update or confirm records by providing social security numbers, bank and credit card information, and other confidential data either by responding to the e-mail message, by entering the information at a bogus website, or by calling a telephone number.

In this example, references to the University are used to try to trick you into responding.

But, you can be sure this email is fake because the University will never request your username and password.

WHAT ARE THE MOST IMPORTANT TOOLS AND TECHNOLOGIES FOR SAFEGUARDING INFORMATION RESOURCES?

Identity Management and Authentication

- all users and their system privileges, assigning each user a unique digital identity for accessing each system.

- It also includes tools for authenticating users, protecting user identities, and controlling access to system resources.
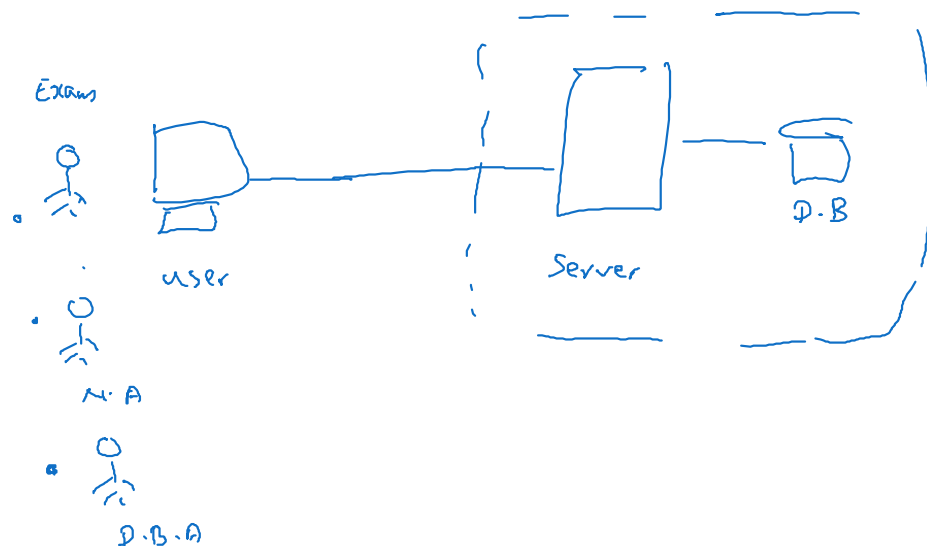
Authentication..

- To gain access to a system, a user must be authorized and authenticated. Authentication refers to the ability to know that a person is who he or she claims to be.

- Authentication is often established by using passwords known only to authorized users.

- New authentication technologies, such as tokens, smart cards, and biometric authentication, overcome some of these problems
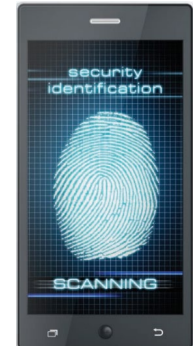
Firewalls, Intrusion Detection Systems, and Antivirus Software

- Without protection against malware and intruders, connecting to the Internet would be very dangerous.

- Firewalls, intrusion detection systems, and antivirus software have become essential business tools.
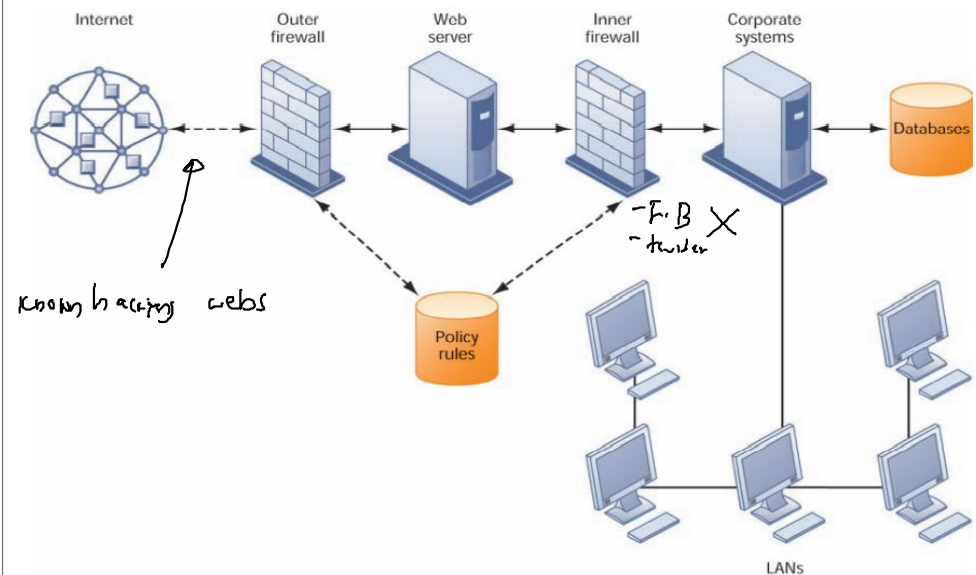
Firewalls

- Firewalls prevent unauthorized users from accessing private networks.

- It is a combination of hardware and software that controls the flow of incoming and outgoing network traffic.

- It is generally placed between the organization's private internal networks and external networks, such as the Internet, although firewalls can also be used to protect one part of a company's network from the rest of the network .

Firewalls..

- It checks this information against the access rules that the network administrator has programmed into the system. The firewall prevents unauthorized communication into and out of the network.
- There are a number of firewall screening technologies, including
  - static packet filtering,
  - stateful inspection
  - Network Address Translation
  - application proxy filtering.
- They are frequently used in combination to provide firewall protection.

FIGURE 8.5   A CORPORATE FIREWALL

The firewall is placed between the firm's private network and the public Internet or another distrusted network to protect against unauthorized traffic.

Intrusion Detection Systems

- Intrusion detection systems feature full-time monitoring tools placed at the most vulnerable points or hot spots of corporate networks to detect and deter intruders continually.
- The system generates an alarm if it finds a suspicious or anomalous event.
- Scanning software looks for patterns indicative of known methods of computer attacks such as bad passwords, checks to see whether important files have been removed or modified, and sends warnings of vandalism or system administration errors.
- The intrusion detection tool can also be customized to shut down a particularly sensitive part of a network if it receives unauthorized traffic.
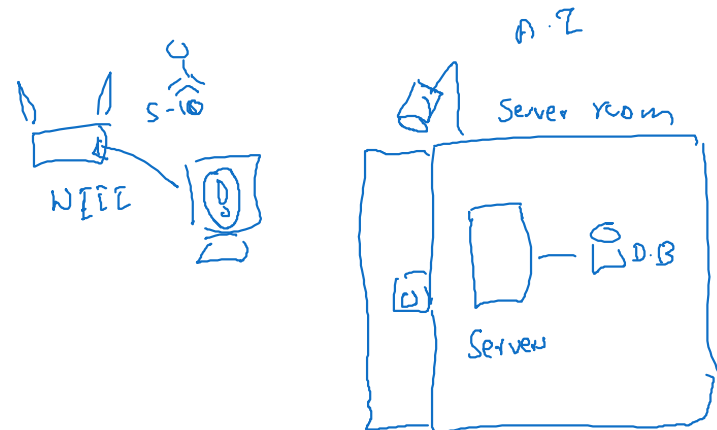
- Antivirus and Antispyware Software Defensive technology plans for both individuals and businesses must include anti-malware protection for every computer.

- Antivirus software prevents, detects, and removes malware, including computer viruses, computer worms, Trojan horses, spyware, and adware.

(handwritten: SPY)
(handwritten: ? Ad)
(handwritten: o Antivirus o Total Security)

Threat Management Systems

- Unified Threat Management Systems To help businesses reduce costs and improve manageability, security vendors have combined into a single appliance various security tools, including firewalls, virtual private networks, intrusion detection systems, and web content filtering and anti-spam software.

- These comprehensive security management products are called unified threat management (UTM) systems.

- UTM products are available for all sizes of networks. Leading UTM vendors include Fortinet, Sophos, and Check Point, and networking vendors such as Cisco Systems and Juniper Networks provide some UTM capabilities in their products.
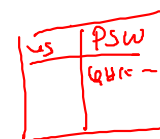
WHAT ARE THE COMPONENTS OF AN ORGANIZATIONAL FRAMEWORK FOR SECURITY AND CONTROL?

Information System Controls

General control

- General controls include
  - software controls
  - physical hardware controls
  - computer operations controls
  - data security controls
  - controls over the systems development process,
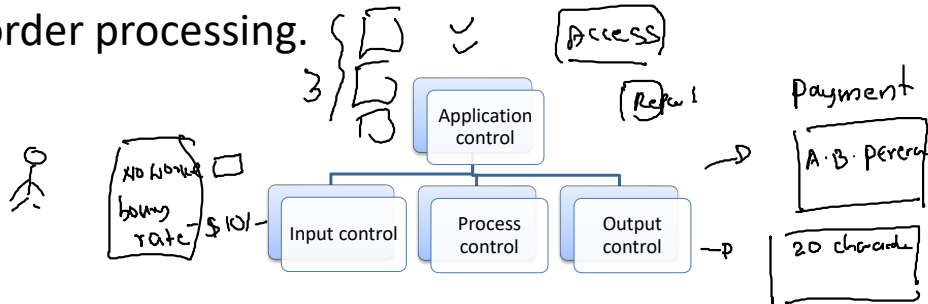 - administrative controls.

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Application controls

- Application controls are specific controls unique to each computerized application, such as payroll or order processing.

Input controls check data for accuracy and completeness
There are specific input controls for input authorization, data conversion, data editing, and error handling

Processing controls establish that data are complete and accurate during updating

Output controls ensure that the results of computer processing are accurate, complete, and properly distributed

Risk assessment

- A risk assessment determines the level of risk to the firm if a specific activity or process is not properly controlled.
- After the risks have been assessed, system builders will concentrate on the control points with the greatest vulnerability and potential for loss.

TABLE 8.5 ONLINE ORDER PROCESSING RISK ASSESSMENT

| EXPOSURE	PROBABILITY OF OCCURRENCE (%)	LOSS RANGE/ AVERAGE ($)	EXPECTED ANNUAL LOSS ($)
Power failure	30%	$5000–$200,000 ($102,500)	$30,750
Embezzlement	5%	$1000–$50,000 ($25,500)	$1275
User error	98%	$200–$40,000 ($20,100)	$19,698

Security Policy

- After you've identified the main risks to your systems, your company will need to develop a security policy for protecting the company's assets.

- A security policy consists of statements
  - ranking information risks
  - identifying acceptable security goals
 - identifying the mechanisms for achieving these goals.

Disaster Recovery Planning and Business Continuity Planning

- Disaster recovery planning devises plans for the restoration of disrupted computing and communications services.
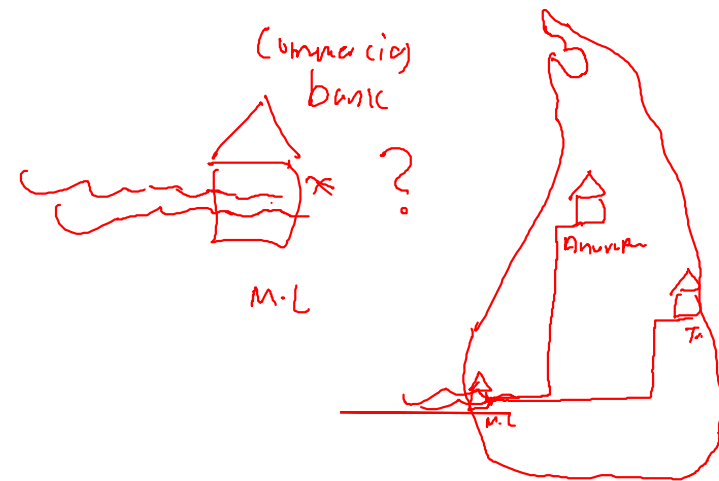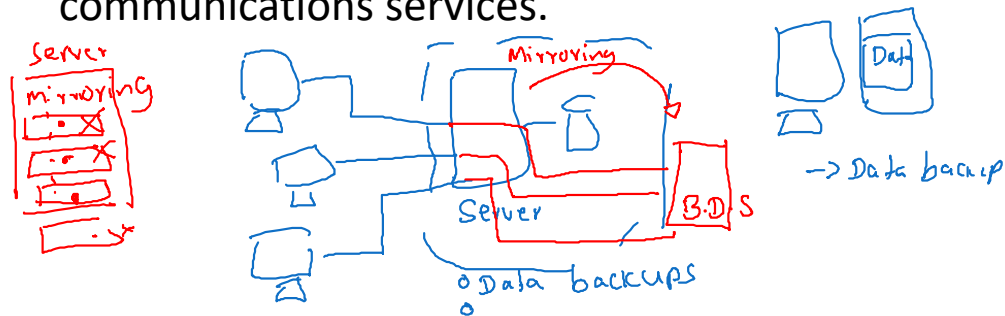
The Role of Auditing

- An information systems audit examines the firm's overall security environment as well as controls governing individual information systems.
- Security audits review technologies, procedures, documentation, training, and personnel.
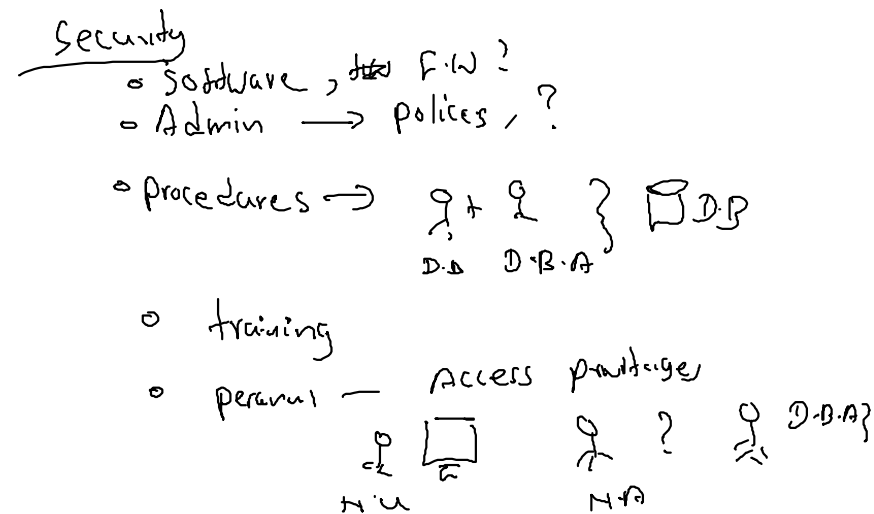
END

Information Systems in Global Business Today

How are information systems transforming business?

- There are three interrelated changes in the technology area:

(1) the emerging mobile digital platform

(2) the growing business use of "big data,"

(3) the growth in "cloud computing,"

1. The emerging mobile digital platform

- More and more business computing is moving from PCs and desktop machines to these mobile devices.

- Managers are increasingly using these devices to coordinate work, communicate with employees, and provide information for decision making.

- emerging mobile platform greatly enhances the accuracy, speed, and richness of decision making

New in mobile platform

- The small, lightweight netbooks optimized for wireless communication and Internet access.
- tablet computers such as the iPad, and digital e-book readers such as Amazon's Kindle with some web access capabilities.
- Smartphones and tablet computers are increasingly used for business computing as well as for consumer applications.
- Wearable computing devices are a recent addition to the mobile digital platform. These include smartwatches, smart glasses, smart ID badges, and activity trackers.

- **Examples of wearable computer**
- Smart Watch
- Head-Mounted Displays (HMDs)
- Smart Clothing
- Smart Jewelry e.g. smart ring
- Google Glass
- Apple Glass
- Microsoft HoloLens
- Bar Code Reader
- Eye Trackers
- Face Detection
- Detecting Six Sense Gestures
- Measuring of body temperature

Wearable Computer

Wearable devices in business

1. Businesses can use smart wearables to connect technicians to vital information about the equipment they are servicing;

Wearable devices in business

2. allow field workers remote access to inspections information;

Wearable devices in business

3. track employees in challenging environments:

 they can make sure a firefighter is healthy enough to enter a burning building.

Opportunities

- Both time shifting and space shifting are the norm.
  - Time shifting refers to business being conducted continuously 24/7 rather than in narrow "work day" time bands of 9 a.m. to 5 p.m.
  - Space shifting means that work takes place in a global workshop, as well as within national boundaries.

Securing Mobile Platforms

- Devices need to be secured like desktops and laptops against malware, theft, accidental loss, unauthorized access, and hacking attempts.

Securing Mobile Platforms ..

- Companies should make sure that their corporate security policy includes mobile devices.
- They will need mobile device management tools to authorize all devices in use;
- to maintain accurate inventory records on all mobile devices, users, and applications;
- To control updates to applications;
- lock down or erase lost or stolen devices so they can't be compromised.

Securing Mobile Platforms ..

- Firms should develop guidelines stipulating approved mobile platforms and software applications as well as the required software and procedures for remote access of corporate systems.

- All mobile device users should be required to use the password feature found in every smartphone.

- Mobile security products are available from Kaspersky, Symantec, Trend Micro, and McAfee.

(2) the growing business use of "big data"

- **Big Data** is a collection of data that is huge in volume, yet growing exponentially with time. It is a data with so large size and complexity that none of traditional data management tools can store it or process it efficiently.

- Big data is also a data but with huge size.

What is an Example of Big Data?

- The **New York Stock Exchange** is an example of Big Data that generates about *one terabyte* of new trade data per day.

- **Social Media** The statistic shows that *500+terabytes* of new data get ingested into the databases of social media site **Facebook**, every day. This data is mainly generated in terms of photo and video uploads, message exchanges, putting comments etc.

- A single **Jet engine** can generate *10+terabytes* of data in *30 minutes* of flight time. With many thousand flights per day, generation of data reaches up to many *Petabytes.*

Advantages Of Big Data Processing

- **Businesses can utilize outside intelligence while taking decisions**

Access to social data from search engines and sites like facebook, twitter are enabling organizations to fine tune their business strategies.

- **Improved customer service**

Traditional customer feedback systems are getting replaced by new systems designed with Big Data technologies. In these new systems, Big Data and natural language processing technologies are being used to read and evaluate consumer responses.

- **Early identification of risk to the product/services, if any**
- **Better operational efficiency**

(3) the growth in "cloud computing,"

- Cloud computing refers to a model of computing that provides access to a shared pool of computing resources (computers, storage, applications, and services) over the network, often the Internet.
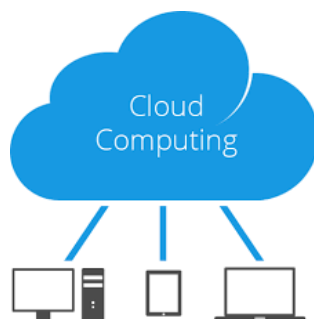
Advantages

- **Cost**

Cloud computing eliminates the capital expense of buying hardware and software and setting up and running on-site datacenters—the racks of servers, the round-the-clock electricity for power and cooling, and the IT experts for managing the infrastructure. It adds up fast.

- **Speed**
- Most cloud computing services are provided self service and on demand, so even vast amounts of computing resources can be provisioned in minutes, typically with just a few mouse clicks, giving businesses a lot of flexibility and taking the pressure off capacity planning.


- **Global scale**
- The benefits of cloud computing services include the ability to scale elastically. In cloud speak, that means delivering the right amount of IT resources—for example, more or less computing power, storage, bandwidth—right when they're needed, and from the right geographic location.

- **Productivity**
- On-site datacenters typically require a lot of "racking and stacking"—hardware setup, software patching, and other time-consuming IT management chores. Cloud computing removes the need for many of these tasks, so IT teams can spend time on achieving more important business goals.
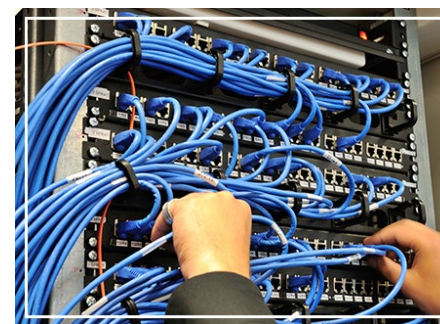
- **Performance**
- The biggest cloud computing services run on a worldwide network of secure datacenters, which are regularly upgraded to the latest generation of fast and efficient computing hardware. This offers several benefits over a single corporate datacenter, including reduced network latency for applications and greater economies of scale.

- **Reliability**
- Cloud computing makes data backup, disaster recovery, and business continuity easier and less expensive because data can be mirrored at multiple redundant sites on the cloud provider's network.

- **Security**
- Many cloud providers offer a broad set of policies, technologies, and controls that strengthen your security posture overall, helping protect your data, apps, and infrastructure from potential threats.

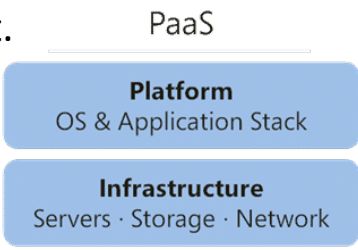# Types of cloud services:
IaaS, PaaS, serverless, and SaaS

Types of cloud services:

- ## Infrastructure as a service (IaaS)

- The most basic category of cloud computing services. With IaaS, you rent IT infrastructure—servers and virtual machines (VMs), storage, networks, operating systems—from a cloud provider on a pay-as-you-go basis.

IaaS

Infrastructure
Servers · Storage · Network
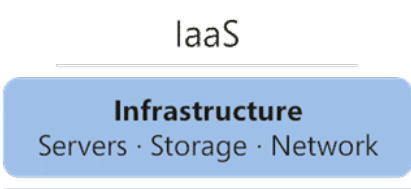
Types of cloud services:

- ## Platform as a service (PaaS)

- Platform as a service refers to cloud computing services that supply an on-demand environment for developing, testing, delivering, and managing software applications. PaaS is designed to make it easier for developers to quickly create web or mobile apps, without worrying about setting up or managing the underlying infrastructure of servers, storage, network, and databases needed for development.

PaaS

Platform
OS & Application Stack

Infrastructure
Servers · Storage · Network

Types of cloud services:

- ## Serverless computing

- Overlapping with PaaS, serverless computing focuses on building app functionality without spending time continually managing the servers and infrastructure required to do so. The cloud provider handles the setup, capacity planning, and server management for you. Serverless architectures are highly scalable and event-driven, only using resources when a specific function or trigger occurs.
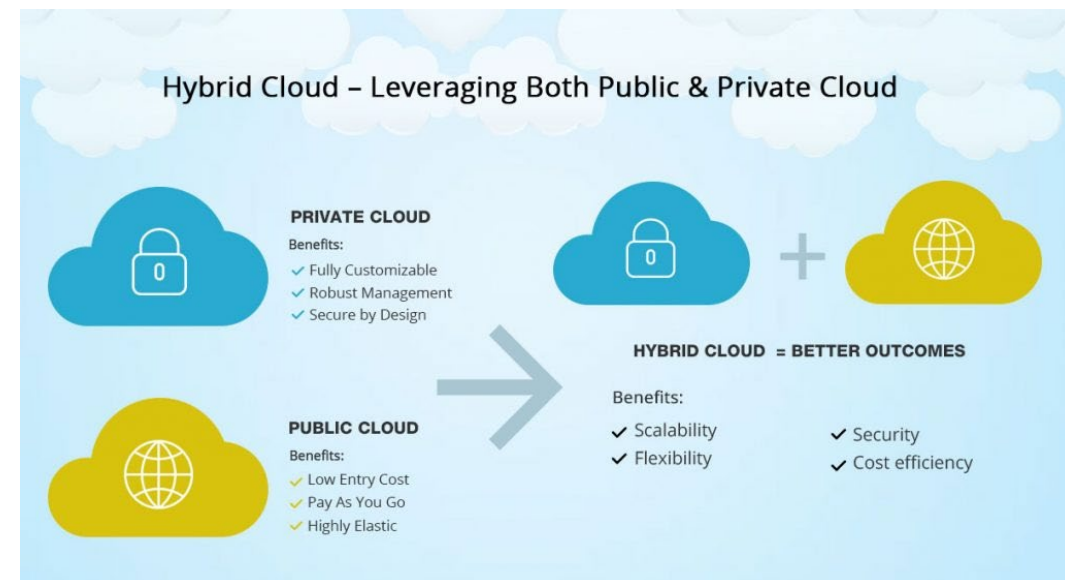
Types of cloud services:

- ## Software as a service (SaaS)

- Software as a service is a method for delivering software applications over the Internet, on demand and typically on a subscription basis. With SaaS, cloud providers host and manage the software application and underlying infrastructure, and handle any maintenance, like software upgrades and security patching. Users connect to the application over the Internet, usually with a web browser on their phone, tablet, or PC.

SaaS

Applications
Packaged Software

Platform
OS & Application Stack

Infrastructure
Servers · Storage · Network
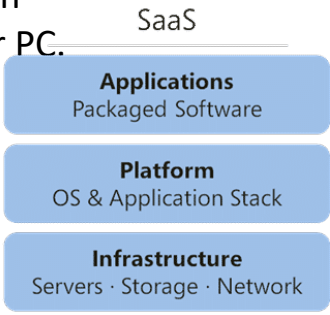
Different types of cloud computing deployment models are:

- Public cloud
- Private cloud
- Hybrid cloud
- Community cloud
- Multi-cloud

https://www.geeksforgeeks.org/cloud-deployment-models/

SaaS

Applications
Packaged Software

PaaS

Platform
OS & Application Stack

Platform
OS & Application Stack

IaaS

Infrastructure
Servers · Storage · Network

Infrastructure
Servers · Storage · Network

Infrastructure
Servers · Storage · Network

Private cloud

Public cloud shared by multiple companies

Company A — Company A's private cloud

Company B — Public Cloud — Company E
Company C — Company D

Hybrid Cloud

Public Cloud ⇄ Private Cloud
Data & Connection Applications

Hybrid Cloud – Leveraging Both Public & Private Cloud

PRIVATE CLOUD
Benefits:
- Fully Customizable
- Robust Management
- Secure by Design

PUBLIC CLOUD
Benefits:
- Low Entry Cost
- Pay As You Go
- Highly Elastic

HYBRID CLOUD = BETTER OUTCOMES

Benefits:
- Scalability
- Flexibility
- Security
- Cost efficiency

END