Lecture 1 Introduction to Information Systems TU262

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Times

Lectures and labs times

Lecture – Monday 18.00 to 20.00

Lab – Monday 20.00 to 22.00

Module Aims

The aims of this module are:

- Enable the student to create new relational databases by devising a high-level conceptual data model,
- Transform that data model into a relational schema,
- Implement the relational schema correctly and robustly in SQL

Learning Outcomes

On completion of this module, the successful learner will be able to:

- Design and evaluate a relational database schema for a software application
- Devise and implement a set of relational tables and develop the relational database.
- Query a relational database using SQL
- Evaluate the use of relational and non-relational data storage technologies

Course Content

This course covers database management system design principles and techniques.

Topics will include

- Database management
- Database modelling
- SQL
- Database security
- Distributed Databases
- Data and database integration
- Optimisation and tuning, concurrency, recovery and integrity

Books and resources

Book titles

Fundamentals of Database Systems - 7th Ed,Elmasri & Navathe(Main Book)

Database Systems: A Practical Approach to Design, Implementation and Management - 6/E Ed. Connolly & Begg

Principles of Information Systems - 10th Ed. Ralph M. Stair, George W. Reynolds

Various research papers

Web

SQL: http://www.w3schools.com/sql

SQL: http://www.sqlzoo.net/

Assessment for this course

Assignments – 50%

Case Study– 50%

Labs

Hands on experience with data modelling and setting up databases

Various available – Erwin (Academic Edition of erwin Data Modeler), Oracle or MySQL

Who has used what?

Principles and Learning Objectives

- The value of information is directly linked to how it helps decision makers achieve the organization's goals.
  - ➢ Distinguish data from information and describe the characteristics used to evaluate the quality of data

Principles and Learning Objectives

- Knowing the potential impact of information systems and having the ability to put this knowledge to work can result in a successful personal career, organizations that reach their goals, and a society with a higher quality of life.

  - Identify the basic types of business information systems and discuss who uses them, how they are used, and what kinds of benefits they deliver.

Principles and Learning Objectives

- System users, business managers, and information systems professionals must work together to build a successful information system.

  - Identify the major steps of the systems development process and state the goal of each.

Principles and Learning Objectives

- The use of information systems to add value to the organization can also give an organization a competitive advantage.
  - Identify the value-added processes in the supply chain and describe the role of information systems within them.
  - Identify some of the strategies employed to lower costs or improve service.
  - Define the term competitive advantage and discuss how organizations are using information systems to gain such an advantage.

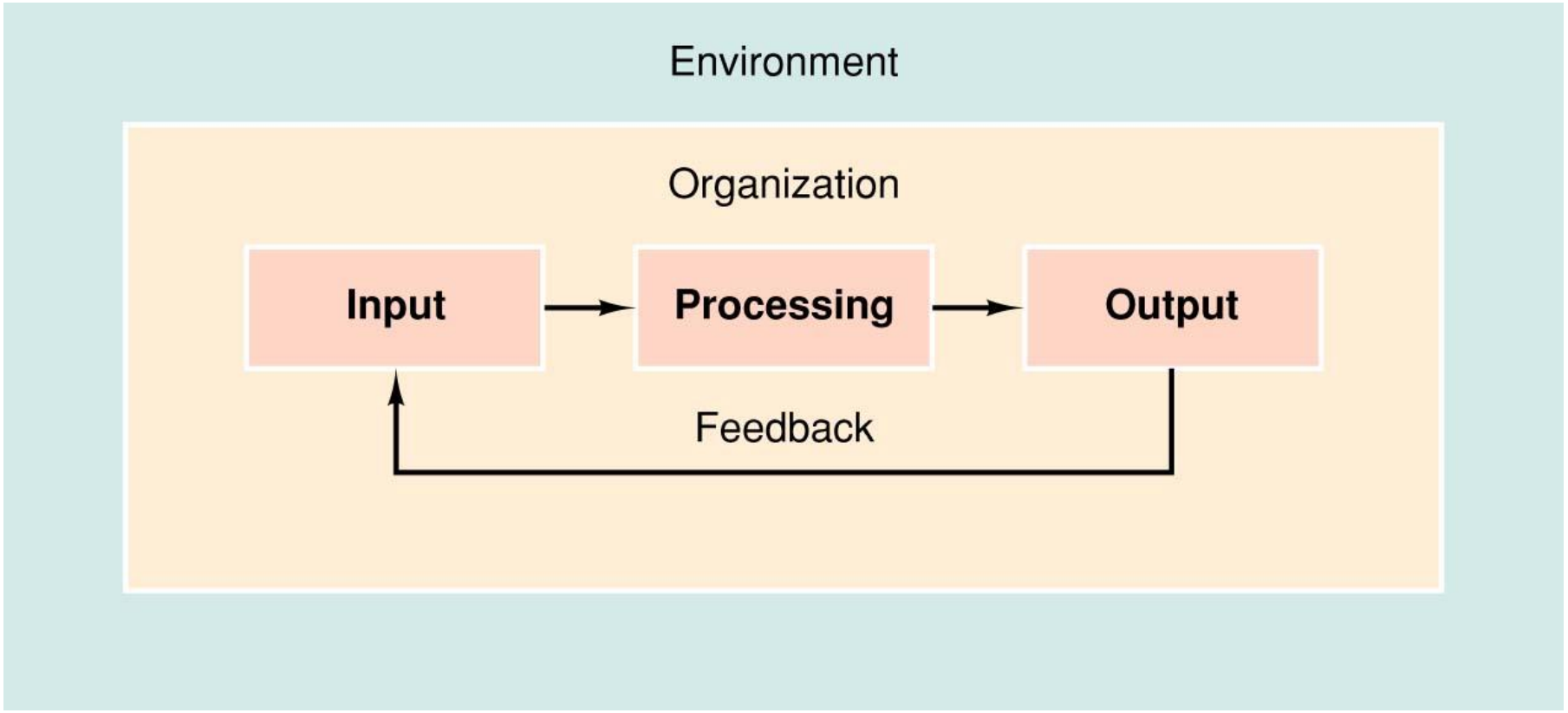
Principles and Learning Objectives

- Information systems personnel are the key to unlocking the potential of any new or modified system.

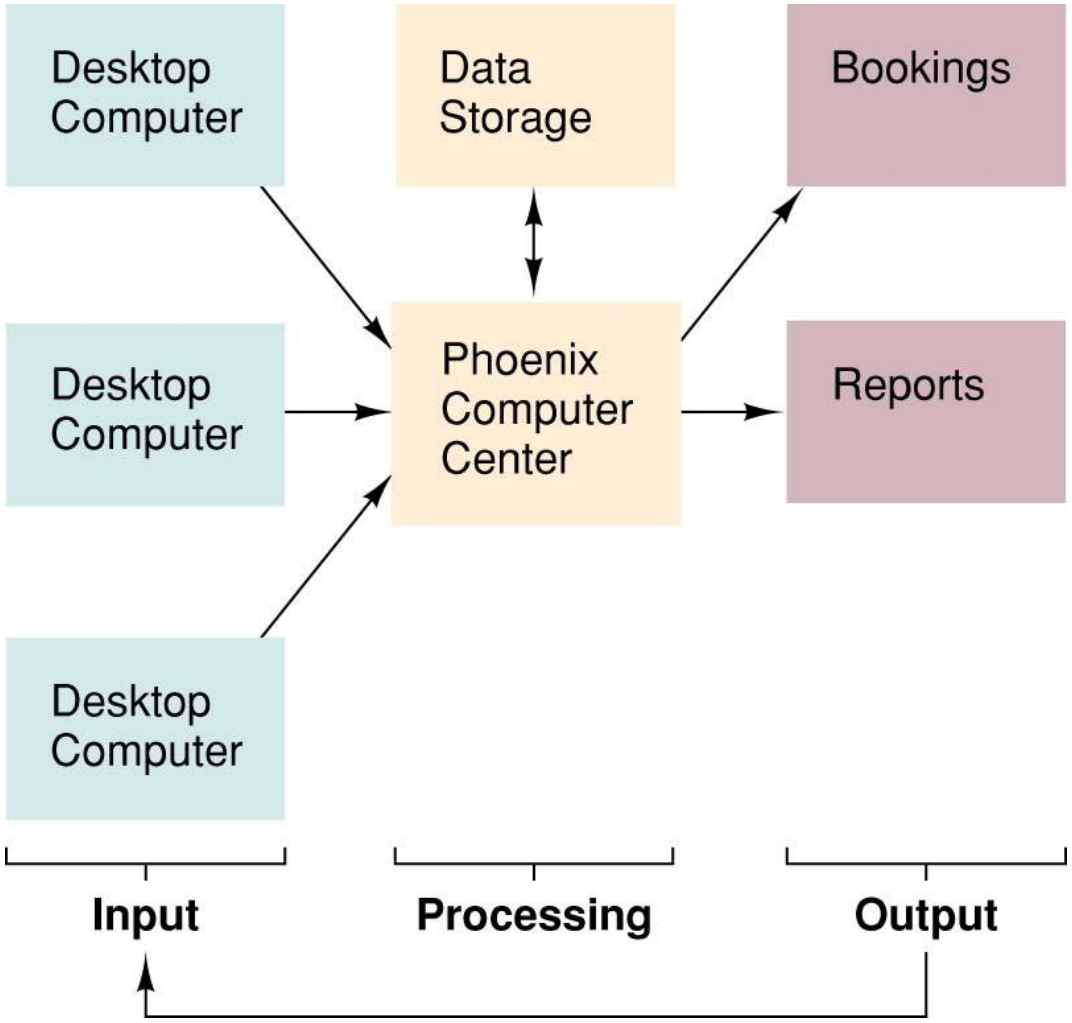
  - Define the types of roles, functions, and careers available in information systems

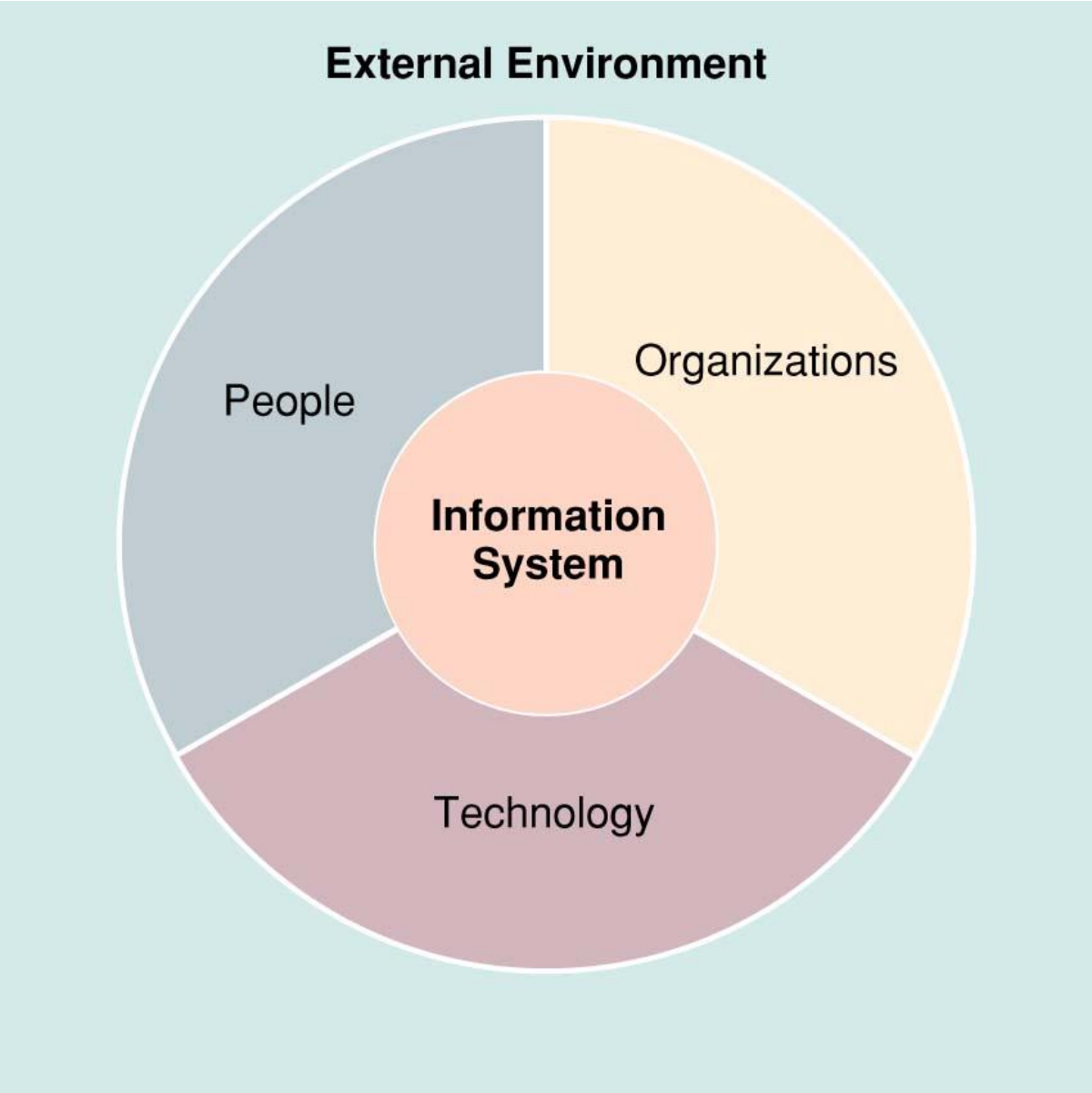
What is IS?

- IS – a set of interrelated components working together to collect, retrieve, process, store, and distribute information for the purpose of facilitating planning, control, coordination, analysis, and decision making in business organizations
- Input-process-output perspective
- People-organization-technology perspective


Environment
Organization
Input
Processing
Output
Feedback

Choice Hotels Reservation System example:




External Environment
People
Organizations
Information System
Technology

- Technology – the means by which data is transformed and organized for business use:
  - Hardware
  - Software
  - Database
  - Telecommunication
- People – the users of IS
- Organization -- a collection of functional units working together to achieve a common goal

Functional units of business organizations:

- production
- sales/marketing
- finance/accounting
- human resources

→ maximize profit by producing goods and/or services

Functional Areas of Business

- The **manufacturing and production** function is responsible for producing the firm's goods and services. There are three stages of the manufacturing/ production process:
  - inbound logistics
  - production
  - outbound logistics

Functional Areas of Business

- The **sales and marketing** function is responsible for finding members for the firm's product or service and selling the firm's product or service to those members. The sales and marketing process consists of
- identifying and creating markets
  - developing markets
  - maintaining markets

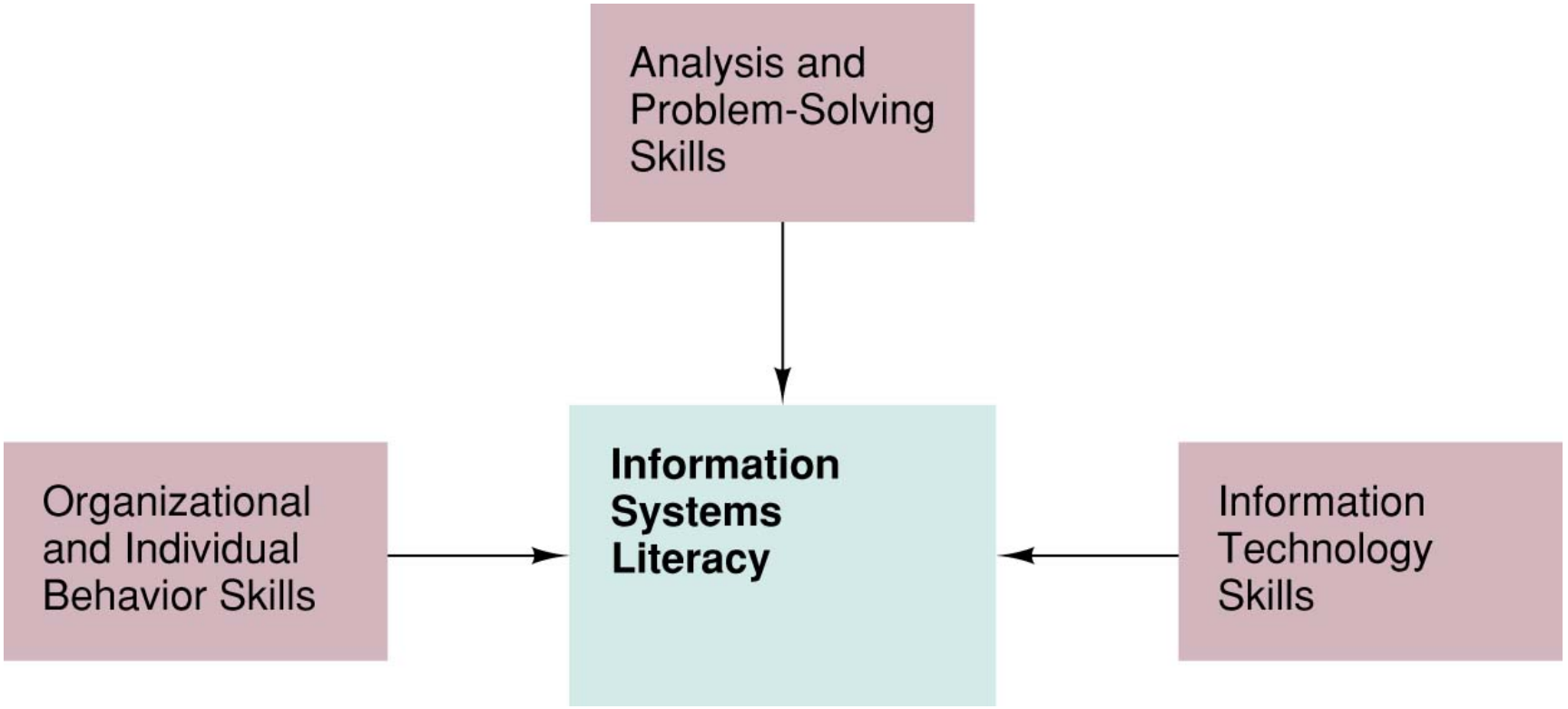
Functional Areas of Business

- The **finance and accounting** function is responsible for managing the firm's financial assets and maintaining the firm's financial records. The finance process involves managing the firm's financial assets, whereas the accounting process is involved primarily in financial record keeping.

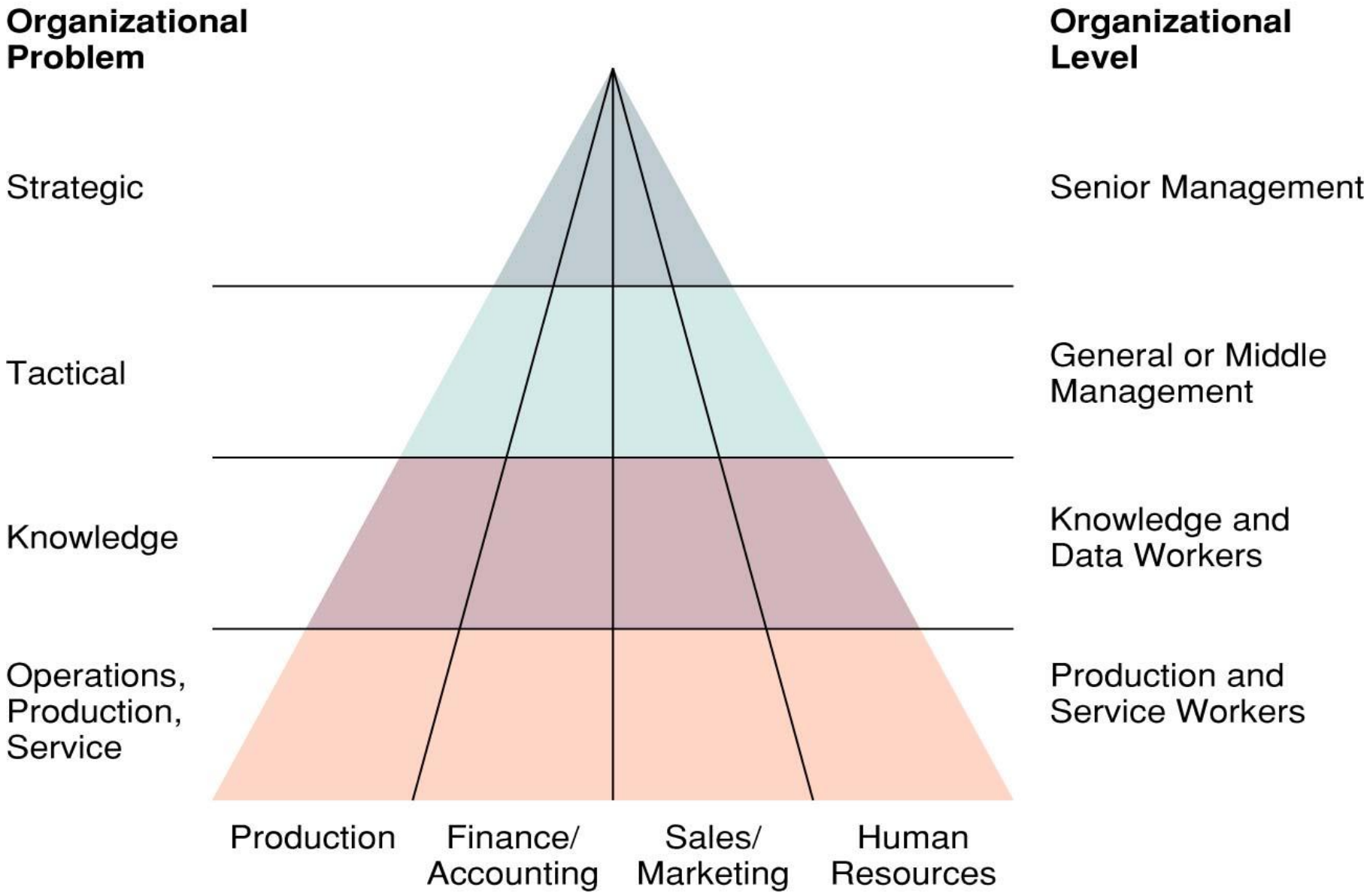
Functional Areas of Business

- The **human resource function** is responsible for attracting and maintaining an appropriate work force for the firm. The human resources process entails
  - attracting the work force
  - developing the firm's work force to meet the firm's personnel needs
  - maintaining the work force

Computer vs IS literacy



Career Skill	Analysis/Problem Solving	Behavior and Communication Skills	Technology Skills
Specific Skills	Analytic framework Functional requirements Physical design Implementation Systems development	Organizational strategy Structure Culture Making decisions Business procedures and functions	Hardware Software Telecommunications Database
Relevant Courses	Philosophy English literature History Behavioral sciences Mathematics	Psychology Sociology Economics English literature Languages Speech	MIS Database Telecommunications Advanced software


Organizational Problem
Organizational Level
Strategic
Senior Management
Tactical
General or Middle Management
Knowledge
Knowledge and Data Workers
Operations, Production, Service
Production and Service Workers
Production
Finance/ Accounting
Sales/ Marketing
Human Resources

Role of IS in Business

Competitive advantage

- Low-cost (value chain)
- Market niche
- Product differentiation
- member loyalty

Globalization

- People (language)
- Organization (culture)
- Technology (telecommunication)

The value chain views the firm as a series of basic activities that add value to a firm's products or services

Primary activities

- inbound logistics,
- operations,
- outbound logistics,
- sales and marketing
- service

Support activities

- administration and management
- human resources
- technology and procurement.

Quality

- Process simplification
- Benchmarking
- member focus
- Cycle time reduction
- Improve design & production
- Error reduction

Reengineering

- Business processes redesign

Ethical & social responsibility

- Information rights & privacy
- Intellectual property
- Accountability & liability
- Quality of life

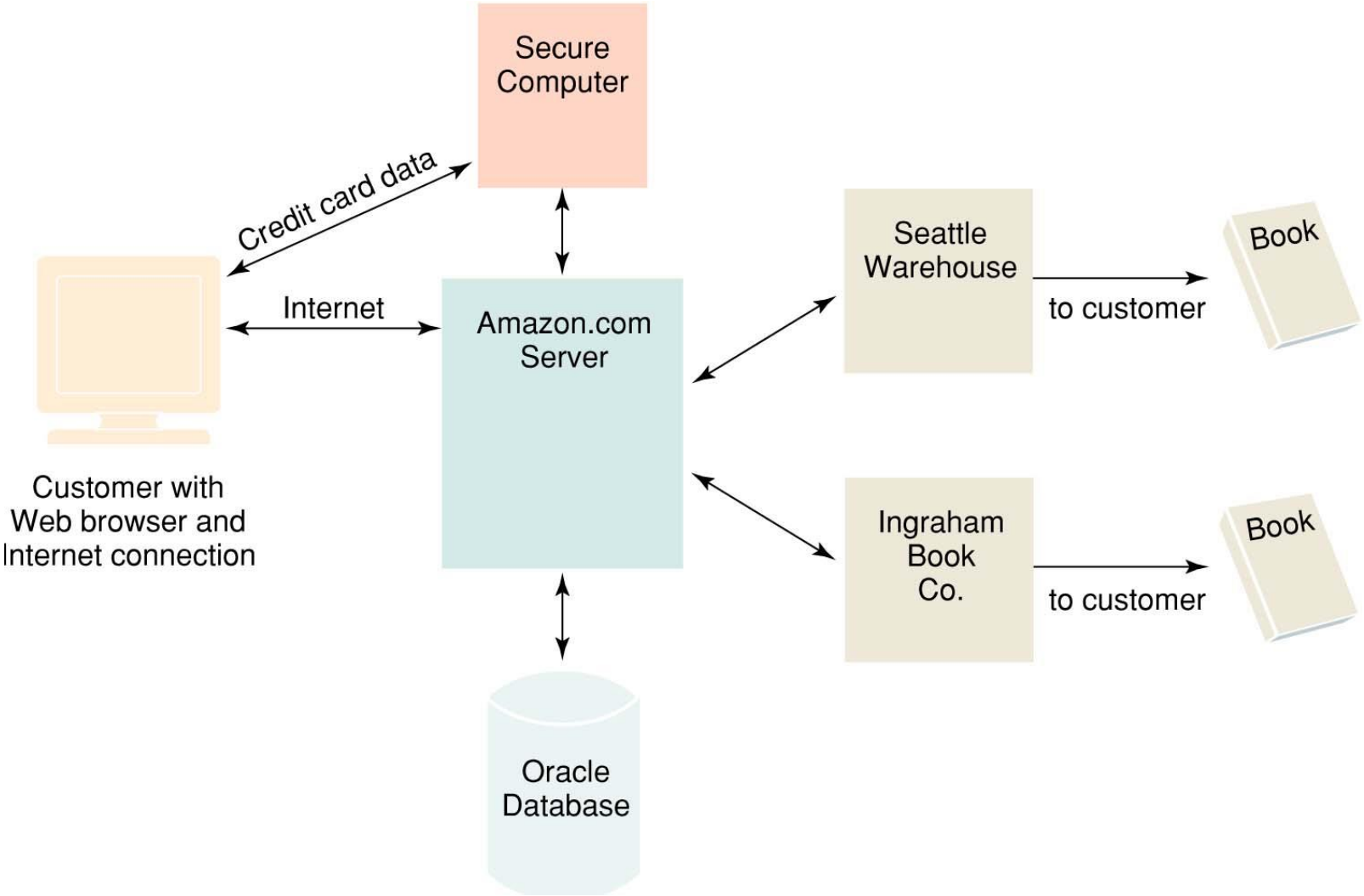
Examples of basic manufacturing/production systems are:

- materials purchasing
- receiving
- shipping
- process control
- numerical control
- equipment
- quality control
- labor costing
- robotic systems

Examples of basic sales/marketing systems are:

- sales
- telemarketing
- order processing
- point-of-sales systems
- credit authorization

Amazon.com Book Order Processing System



Examples of basic finance/accounting systems are:

- accounts receivable
- accounts payable
- general ledger
- payroll
- cash management
- loan processing
- check processing
- securities trading

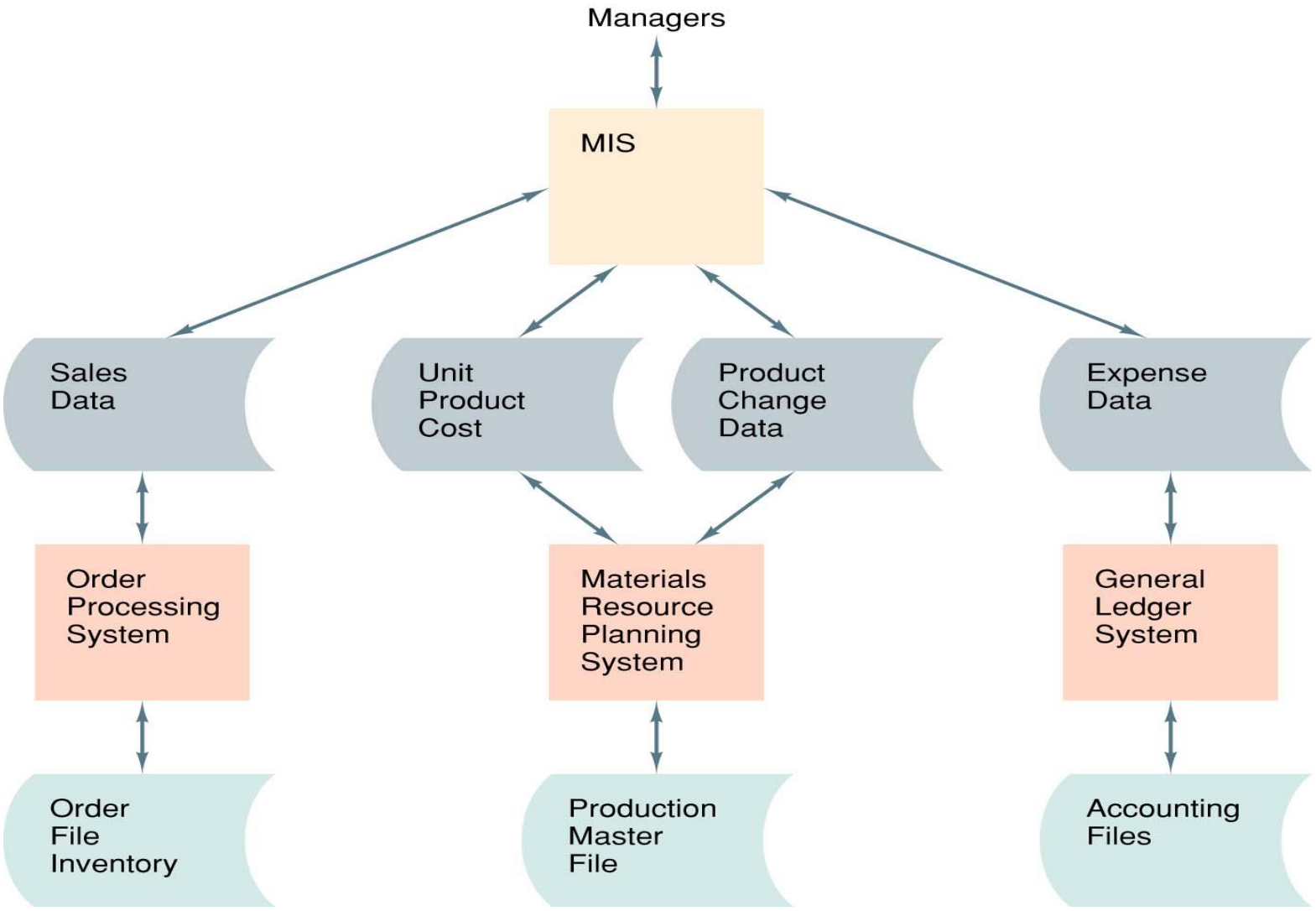
Examples of basic human resource systems are:

- personnel record keeping
- applicants tracking
- positions listing
- training and skills
- benefits

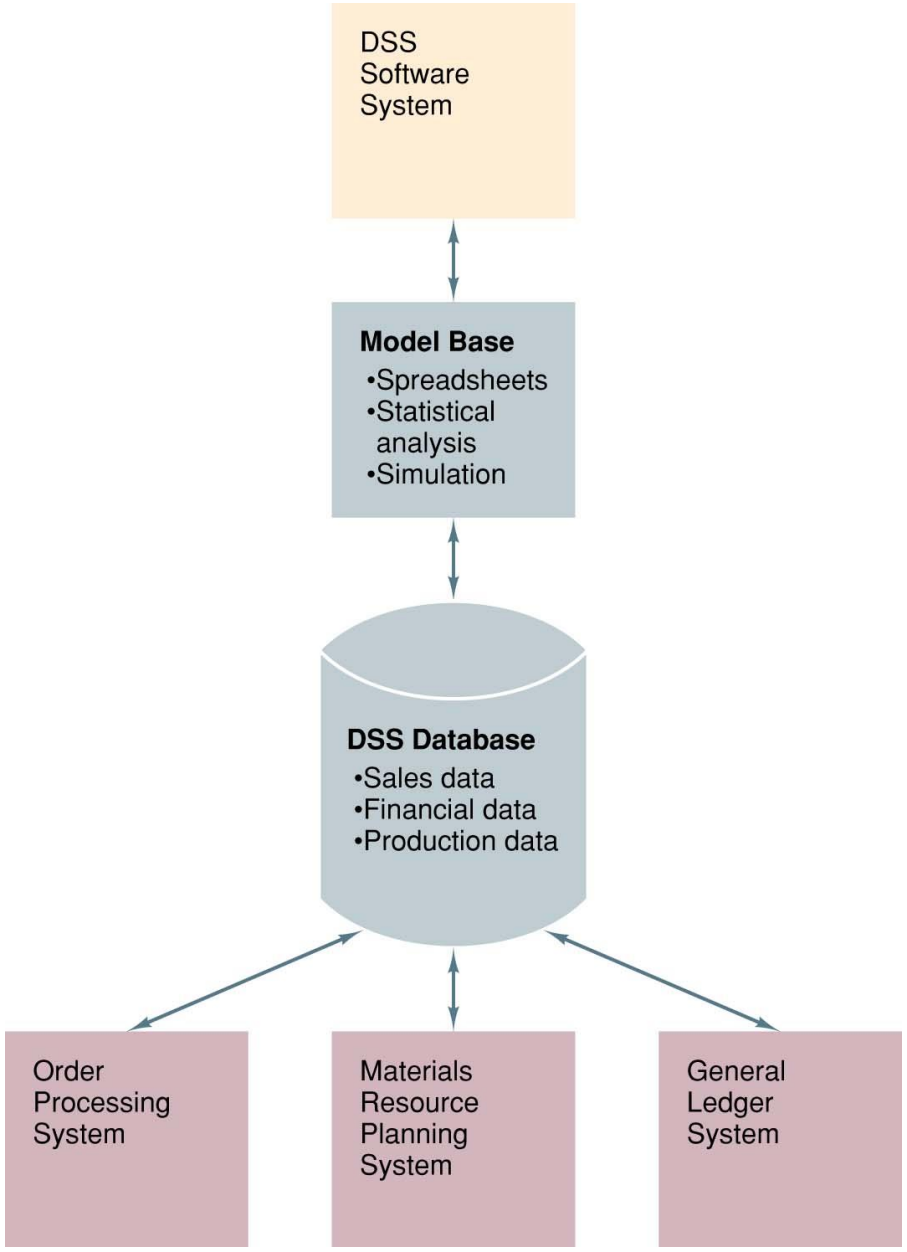
Management Support Systems

- MIS: summarize & report on the basic operations of a company
- DSS: provide data & models interactively to support semi-structured problem solving
- ESS(executive support system): provide data from both internal & external sources to support unstructured problem solving

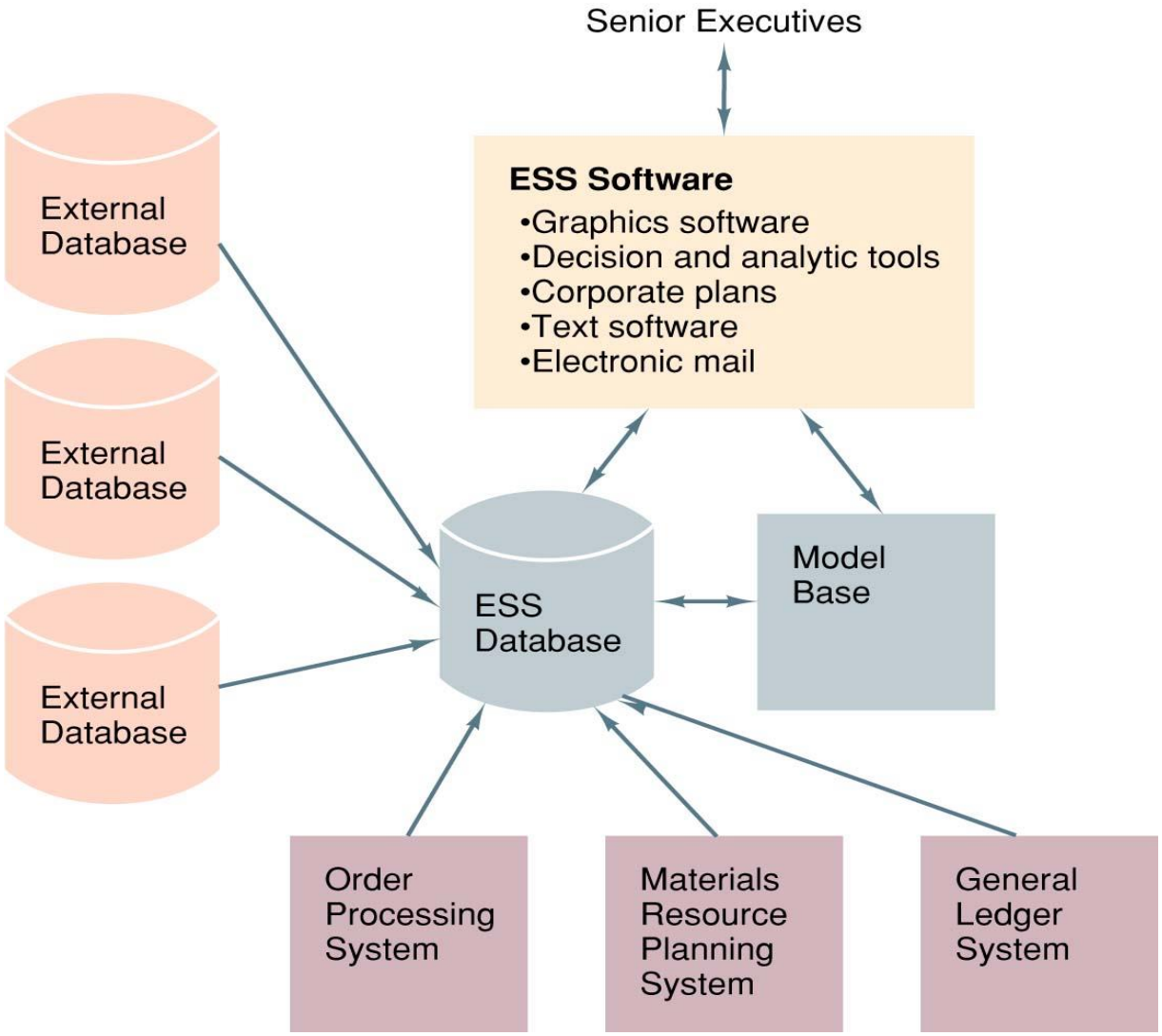
An MIS


Managers
MIS
Sales Data
Unit Product Cost
Product Change Data
Expense Data
Order Processing System
Materials Resource Planning System
General Ledger System
Order File Inventory
Production Master File
Accounting Files

An DSS


DSS
Software
System
Model Base
•Spreadsheets
•Statistical
analysis
•Simulation
DSS Database
•Sales data
•Financial data
•Production data
Order
Processing
System
Materials
Resource
Planning
System
General
Ledger
System

An ESS


Senior Executives
ESS Software
•Graphics software
•Decision and analytic tools
•Corporate plans
•Text software
•Electronic mail
External Database
External Database
External Database
ESS Database
Model Base
Order Processing System
Materials Resource Planning System
General Ledger System

Expert Systems

- Solve problems that require expertise
- Use facts and reasoning (rules of thumb)
- Explain what it knows and its reasoning process

3 components:

- Knowledge base
- Inference engine
- User interface

Why Learn About Information Systems?

- Advance in your career
- Solve problems
- Realize opportunities
- Meet your career goals

Databases

What is a database ?

Shared collection of logically related data (and a description of this data), designed to meet the information needs of an organization.

So…

Why use a database

Scenario You are a Film Club manager.

- You are a film club manager.
- Members book seats in club .
- Several shows of each film.

Needs

- Which film has a member booked?
- Are any show fully booked?
- When will a show become available?

Solution: a file based system

Edit booking.txt file

Member: Cindy Liu, booked: Harry Potter, Due: 7 pm Sat. 16, 2017

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Advantages

- Text editors are easy to use
- Simple to insert a record
- Simple to delete a record

Complication: Queries

Does not address needs Query:

What films has Cindy Liu bookeded?

Execute (not quite right): Search for ‘Cindy Liu’.

Search for

‘^\s+Member:\s*Cindy\s+Liu\s*,\s+booked:’.

Query: Are any show fully booked?

Execute: ???

Requirements

- Robust, sophisticated query language
- Clear separation between data organization (schema) and data

Complication: Queries

Lacks data *integrity*, *consistency*

- Clerk misspells value/field
- Member: Cindy Lui, Booked: Harry Potter, Deu: Sep. 16, 2020

- Inputs improper value, same value differently
- Member: Cindy Liu, Booked: Harry Potter2, Due: Sep. 16, 2020
-
- Forgets/adds/reorders field
- Terms: weekly special Due: Sep. 16, 2020,

Requirements

- Enforce *constraints* to permit only *valid* information to be input.

Complication: Update

Add/delete/update fields in every record

- Record club location.
- Member: JD, Booked: Frozen, Due : Sep. 19, 2020, club: Bry

- Modify member to first and surname.
- First: Joe, Surname: Doe, Booked: Frozen, Due: Sep. 29, 2017

Add/delete/update new information collections

- member.txt file to record information

  Member: Jane Doe, Phone: 5575 3344

Requirements

- Ability to manipulate the way data is organized.

Complication: Multiple Users

Two clerks edit booked.txt file at the same time.

1) Ben starts to edit booked.txt, reads it into memory.
2) Sarah starts to edit booked.txt.
3) Ben adds a record.
4) Ben saves booked.txt to disk.
5) Sarah saves booked.txt to disk.

Ben’s added record disappears!

Requirements

- Must support multiple readers and writers.
- Updates to data must (appear to) occur in *serial* order.

Complication: Crashes

Crash during update may lead to inconsistent state.

- Ben makes 250 of 500 edits to change Jane Doe to her preferred name Jan Doe.
- Before he saves it, Windows crashes!

Requirements

- Must update on all or none basis.
- Implemented by *commit* or *rollback* if necessary.

Complication: Data Physically Separate

Wants

- Want to advise Austin Power's fans about new A P's film.

Method

- member.txt contains addresses of members.
- Must merge with booked.txt to create mailing list.

Problems

- Text editors incapable of such a merge (write a program)
- Several Joe Jenkins

Requirements

- Uniquely identify each member.

Complication: Security

Members want to know how many people a film has been booked.

- Provide access to *booked.txt*, but not to member field, how to I do that in an editor?

Underage clerks should not see history of R-rated bookings.

- Keep two lists of booking?

Requirements

- Ability to control who has access to what information.

Complication: Efficiency

All club managers in Dublin get together

- booked.txt file gets huge (gigabytes of data).
- Slow to edit.
- Slow to query for member information.

Requirements

- New data structures to improve query performance.
- System automatically modifies queries to improve speed.
- Ability of system to scale to handle huge datasets.

Complication: New Needs

All club managers in Dublin get together.

- What pairs of films are often booked together?
- Calculate probability of film combinations.
- Do we need more shows of the Austin Powers film anywhere?
- Plot booking history of Austin Powers by club area.

Requirements

- Collect and analyse summary data.
- Use computer to *mine* for interesting trends.
- Support access to data by sophisticated programs.

Data and Databases

Why are Databases important?

- Can't have a system without persistent data storage (usually)
- An organisation's data is stored in databases (usually)

Databases are important to you because..

- A critical part of any organisation's IT infrastructure
- A fundamental part of an IT professional's knowledge

Who has used a dB today?

Examples of dB applications

- Purchases from the supermarket
- Purchases using your credit card
- Booking a holiday at the travel agents
- Using the local library
- Taking out insurance
- Renting a video
- Using the Internet
- Studying at university

Databases
Who's doing what?

Commercial Market Share $

Oracle - Oracle

IBM – DB2, Informix

Microsoft SQL Server – limited to Windows

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Open source
Postgresql
SQLlite ..

What about MySQL?