Chapter 4: Hardware
(Managerial Overview)
Chapter 4: Computer Hardware

Objectives

1. What computer processing and storage capability does our organization need to handle its information and business transactions?

2. What arrangement of computers and computer processing would best benefit our organization?
Chapter 4: Computer Hardware

Hardware components of a computer system

- **Central Processing Unit (CPU)**
  - Input Devices
    - Keyboard
    - Computer mouse
    - Touch screen
    - Source data automation
  - Communications Devices
- **Secondary Storage**
  - Magnetic disk
  - Optical disk
  - Magnetic tape
- **Primary Storage**
  - Output Devices
    - Printers
    - Video display terminals
    - Plotters
    - Audio output
- **Buses**
Chapter 4: Computer Hardware

Computer Generations

1. 1st Generation (early 1950s)
   - Involved massive computers using hundreds and thousands of vacuum tubes for their processing and memory circuitry
   - These large computers generated large enormous amount of heat
   - Vacuum tubes had to be replaced frequently
   - Large electrical power, air-conditioning

2. 2nd Generation (late 1960s)
   - Transistorized circuits were introduced
   - Generate little heat, less expensive, less power
   - Main memory capacities < 100 kb and microsecond processing speed
   - Removable disk packs were introduced
Chapter 4: Computer Hardware

Computer Generations

3. 3rd Generation (1970s)
   - Main memory capacities increased to several MB for processing speed
   - Widespread of minicomputers

4. 4th Generation (1980s – 1990s)
   - Main memory capacities ranging from MB to GB
   - Generate little heat, less expensive, less power
   - Client/server are a hallmark of 4th generation.

5. 5th Generation (evolve 21st century)
   - Main memory of a few thousand characters and millisecond processing speeds.
   - Used magnetic drums/tape for secondary storage
Chapter 4: Computer Hardware

The Computer System

Bit
Binary digit
Represents 0 or 1

Byte
String of eight bits
Stores one number, symbol, character, part of picture
Chapter 4: Computer Hardware

The Computer System

0 or 1 One bit
Characters are represented by one byte for each letter.

0 1 0 0 0 0 0 1 One byte for character A
Chapter 4: Computer Hardware

The Computer System

Storage Capacities Measurement
(i) Kilobytes (KB)
   - 1 KB = 1024 bytes
(ii) Megabytes (MB)
    - 1 MB = about 1 million bytes (1024KB)
(iii) Gigabytes (GB)
     - 1 GB = about 1 billion bytes (1024MB)
(iv) Terabytes (TB)
    - 1 TB = about 1 trillion bytes (1024GB)
Chapter 4: Computer Hardware

The Computer System

The Central Processing Unit (CPU)

Controls other parts of computer

Arithmetic-logic unit performs principle logical/mathematical operations

Control unit coordinates other parts, such as reading a stored program
Chapter 4: Computer Hardware

The Computer System

Primary Storage

Located near CPU
Stores all or part of active software program
Stores operating system software
Stores data the program is using
Chapter 4: Computer Hardware

The Computer System

Primary Storage

Composed of semi-conductors
RAM (random access memory): Used for short-term, temporary storage
ROM (read-only memory): Semiconductor memory chips with program instructions
Chapter 4: Computer Hardware

The Computer System

Central Processing Unit (CPU)

Arithmetic-Logic Unit
22 + 11 = 33
9 < 10

Control Unit

Primary Storage

Data Bus
Address Bus
Control Bus

Input Devices
Output Devices
Secondary Storage

Primary storage address
Chapter 4: Computer Hardware

Computer Processing

Microprocessors

Semiconductor chips integrate memory, logic, and control circuits for entire CPU

Speed depends on number of bits processed at one time; amount of data that can be moved between devices; and cycle speed (MHz/ GHz). I.e.: Intel (QuadCore, Core 2 Duo (C2D)), AMD (AMD Athlon, AMD Opteron, AMD Phenom)

RISC (reduced instruction set computing) increases speed; used for scientific, workstation computing
Chapter 4: Computer Hardware

Computer Processing

Parallel processing

Multiple CPUs work simultaneously on same problem

More than one instruction processed at a time

Massively parallel computers: use hundreds, thousands of processing chips
Chapter 4: Computer Hardware

Computer Processing

Sequential Processing

Program

CPU

Result

Task 1

Program

CPU

Result

Task 2

Parallel Processing

Program

CPU

Task 1

CPU

Task 2

CPU

Task 3

CPU

Task 4

CPU

Task 5

Result
Chapter 4: Computer Hardware

Storage, Input, and Output Technology

Secondary Storage Technology

Used for relatively long-term storage of data outside CPU

Magnetic disk: floppy disks, hard disks, RAID

Optical disk: CD-ROM, CD-RW, DVD

Magnetic tape

Storage networking: direct-attached storage; network-attached storage; storage area networks
Chapter 4: Computer Hardware

A storage area network (SAN)
Chapter 4: Computer Hardware

Storage, Input, and Output Technology

Input Devices

Keyboard and mouse
Touch screen
Optical character recognition
Magnetic ink character recognition (MICR)
Pen-based input
Digital scanner
Audio input
Sensors
Radio-frequency identification (RFID)
Chapter 4: Computer Hardware

Storage, Input, and Output Technology

Output Devices

Cathode-ray tube (CRT)
Printers
Audio output
Chapter 4: Computer Hardware

Storage, Input, and Output Technology

Batch Processing
Accumulates and stores transactions in group or batch until time to process them
Found primarily in older systems for occasional reporting
Use tape storage

Online Processing
Transactions processed immediately
Use disk storage
Chapter 4: Computer Hardware
Storage, Input, and Output Technology

Interactive Multimedia

Integrates sound, video or animation, graphics, text into computer-based application

Streaming technology

New compression standards: MP3 – audio compression / MPEG3 – video compression
Chapter 4: Computer Hardware

Classifying Computers

Personal computer: Portable or desktop microcomputer or tablets

Workstation: More powerful desktop computer used for computation-intense tasks

Supercomputer: Sophisticated, powerful computer used for tasks requiring rapid, complex calculations; weapons research, weather forecasting
Chapter 4: Computer Hardware

Computer Networks and Client/Server Computing

Distributed processing: Distribution of processing work among multiple computers

Centralized processing: Accomplished by one large central computer

Client/server computing: Splits processing between “clients” and “servers” on network
Chapter 4: Computer Hardware

Client
- User interface
- Application function

Server
- Data
- Application function
- Network resources

Requests → Data and services

Diagram showing the interaction between a client and a server with arrows indicating the flow of requests and data.
Chapter 5: Types Of Software

SOFTWARE PROGRAM: A SERIES OF STATEMENTS OR INSTRUCTIONS TO THE COMPUTER

TWO MAJOR TYPES OF SOFTWARE: SYSTEM SOFTWARE AND APPLICATION SOFTWARE

SYSTEM SOFTWARE: GENERALIZED PROGRAMS THAT MANAGE THE COMPUTER’S RESOURCES

APPLICATION SOFTWARE: PROGRAMS WRITTEN FOR OR BY USERS TO PERFORM A SPECIFIC TASK
Chapter 5: Types Of Software

The major types of software

**SYSTEM SOFTWARE**

- **Operating System**
  - Schedules computer events
  - Allocates computer resources
  - Monitors events

- **Language Translators**
  - Interpreters
  - Compilers

- **Utility Programs**
  - Routine operations (e.g., sort, list, print)
  - Manage data (e.g., create files, merge files)

**APPLICATION SOFTWARE**

- Programming languages
  - FORTRAN
  - COBOL
  - VISUAL BASIC
- Assembly language
  - PASCAL
  - C++
- Fourth-generation languages and PC software tools
Chapter 5: Types Of Software

System Software and PC Operating Systems

**OPERATING SYSTEM SOFTWARE:** Manages the computer system, resources; controls memory, input, output, and task scheduling

**COMPUTER LANGUAGE TRANSLATION PROGRAMS:** Compiles source code of high-level language programs (C, FORTRAN) into object code - machine language the computer can execute

**UTILITY PROGRAMS:** Perform routine, repetitive tasks such as copying, clearing primary storage
Chapter 5: Types Of Software

System Software and PC Operating Systems

Operating System Capabilities

Multiprogramming: Concurrent use of CPU by multiple programs

Virtual storage: Breaks programs into smaller portions to read as needed

Time-sharing: Allows many users to share CPU time

Multi-processing: Links two or more CPUs to work in parallel in single computer system
Chapter 5: Types Of Software

System Software and PC Operating Systems

PC Operating Systems

Software written for one OS generally cannot run on another

Graphical User Interface (GUI): Dominant model for user interface for operating systems and applications
Chapter 5: Types Of Software

System Software and PC Operating Systems

Leading PC Operating Systems

Windows XP
Windows 2000
Windows Server 2003
Windows 98/ME
Windows CE
Unix
Linux
Mac OS
DOS (Disk Operating System)
**Trends in computer software**

The trends in software is toward multipurpose, network-enabled, expert assisted packages with natural language and graphical user interfaces.

<table>
<thead>
<tr>
<th>1st Generation</th>
<th>2nd Generation</th>
<th>3rd Generation</th>
<th>4th Generation</th>
<th>5th Generation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trend: Toward Easy to use multipurpose network-enabled application packages for productivity and collaboration.</td>
<td></td>
<td></td>
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</tbody>
</table>

**Software Trends**

- **1st Generation**
  - User written programs, Machine languages.
- **2nd Generation**
  - Packaged programs, Symbolic languages.
- **3rd Generation**
  - Operating Systems, High-level languages.
- **4th Generation**
  - Database Management Systems, Forth-generation languages, Micro-computer packages
- **5th Generation**
  - Natural and OO languages, Multipurpose graphic-interface, network-enabled, expert-assisted packages.

**Trend: Toward Visual or Conversation Programming Languages and Tools**
Example of four levels of programming. This programming language instructions might be used to compute the sum of two numbers as expressed by the formula: \( X = Y + Z \)

<table>
<thead>
<tr>
<th>1) Machine languages:</th>
<th>3) High-Level languages:</th>
</tr>
</thead>
<tbody>
<tr>
<td>* Use binary coded instructions</td>
<td>* Use brief statements or arithmetic notations</td>
</tr>
<tr>
<td>1010 11001</td>
<td>BASIC: ( X = Y + Z )</td>
</tr>
<tr>
<td>1011 11010</td>
<td>COBOL: COMPUTE ( X = Y + Z )</td>
</tr>
<tr>
<td>1100 11011</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>2) Assembler languages</th>
<th>4) Fourth-generation languages</th>
</tr>
</thead>
<tbody>
<tr>
<td>* Use symbolic coded instructions</td>
<td>* Use natural and nonprocedural statements / human language</td>
</tr>
<tr>
<td>LOD Y</td>
<td>SUM THE FOLLOWING NUMBERS</td>
</tr>
<tr>
<td>ADD Z</td>
<td></td>
</tr>
<tr>
<td>STR X</td>
<td></td>
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</tbody>
</table>
### Chapter 5: Types Of Software

#### Categories of Fourth-Generation Languages

<table>
<thead>
<tr>
<th>Category</th>
<th>Functionality</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>PC software tools</td>
<td>General-purpose packages</td>
<td>WordPerfect, Microsoft Access</td>
</tr>
<tr>
<td>Query language</td>
<td>Retrieve data stored in databases or files</td>
<td>SQL</td>
</tr>
<tr>
<td>Report generator</td>
<td>Retrieve data, more formatting control;</td>
<td>Crystal Reports</td>
</tr>
<tr>
<td>Graphics language</td>
<td>Retrieve data, graphics format</td>
<td>SAS Graph; Systat</td>
</tr>
</tbody>
</table>
Chapter 5: Types Of Software

Programming Languages and Contemporary Software Tools

Fourth generation languages: Enable end users to develop applications with minimal or no assistance; less procedural

Procedural languages: Require sequence of steps

Nonprocedural languages: Specify tasks but not details on sequence

Natural languages: Nonprocedural languages resembling human speech

Query languages: Software tools for providing online answers to information requests
Chapter 5: Types Of Software

Programming Languages and Contemporary Software Tools

Object-Oriented Programming

Combine data and methods (procedures) into one object

Objects are independent, reusable building blocks

Based on concepts of class and inheritance
Chapter 5: Types Of Software

Programming Languages and Contemporary Software Tools

Java

Object-oriented
Platform-independent
Robust; handles data, graphics, video, sound
Can create “applets”; often used on Web
Chapter 5: Types Of Software

Programming Languages and Contemporary Software Tools

Hypertext Markup Language (HTML): Page description language; creates Web pages and other hypermedia documents

XML (eXtensible Markup Language): Describes the structure of a document; provides standard format for data exchange

XHTML: Reformulates HTML with XML document-type definitions
Chapter 5: Types Of Software

Application Software Packages and Productivity Software

Word processing software: Create, format, print documents

Desktop publishing software: Produce professional-quality documents with greater formatting, design capabilities

Spreadsheets: Display data in grid for recalculating numerical data

Data management software: Store, manipulate data in lists and databases
Chapter 5: Types Of Software

Text and the spell-checking option in Microsoft Word
Chapter 5: Types Of Software

Spreadsheet software

<table>
<thead>
<tr>
<th>Description</th>
<th>Value 1</th>
<th>Value 2</th>
<th>Value 3</th>
<th>Value 4</th>
<th>Value 5</th>
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<tbody>
<tr>
<td>Total fixed cost</td>
<td>19,000</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Variable cost per unit</td>
<td>3.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average sales price</td>
<td>17.00</td>
<td></td>
<td></td>
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<tr>
<td>Contribution margin</td>
<td>14.00</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Breakeven point</td>
<td>1357</td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

**Custom Neckties Pro Forma Income Statement**

<table>
<thead>
<tr>
<th>Units sold</th>
<th>0.00</th>
<th>679</th>
<th>1357</th>
<th>2036</th>
<th>2714</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revenue</td>
<td>0</td>
<td>11,536</td>
<td>23,071</td>
<td>34,607</td>
<td>46,143</td>
</tr>
<tr>
<td>Fixed cost</td>
<td>19,000</td>
<td>19,000</td>
<td>19,000</td>
<td>19,000</td>
<td>19,000</td>
</tr>
<tr>
<td>Variable cost</td>
<td>0</td>
<td>2,036</td>
<td>4,071</td>
<td>6,107</td>
<td>8,143</td>
</tr>
<tr>
<td>Total cost</td>
<td>19,000</td>
<td>21,036</td>
<td>23,071</td>
<td>25,107</td>
<td>27,143</td>
</tr>
<tr>
<td>Profit/Loss</td>
<td>(19,000)</td>
<td>(9,500)</td>
<td>0</td>
<td>9,500</td>
<td>19,000</td>
</tr>
</tbody>
</table>

**Custom Neckties Breakeven Analysis**

- Fixed Cost
- Total Cost
- Revenue

Dollars (Thousands) vs. Units Sold

0.00 679 1357 2036 2714
0 10 20 30 40 50
Chapter 5: Types Of Software

Data management software
Chapter 5: Types Of Software

Application Software Packages and Productivity Software

Presentation graphics: Create professional-quality graphics and multimedia presentations

Integrated Software Packages and Suites: Combine two or more applications; easy data transfer

E-mail software: Computer exchange of messages

Web browsers: Access and display Web, Internet resources

Groupware: Support activities of workgroups
Chapter 5: Types Of Software

Software for Enterprise Integration and E-Business

Enterprise software: Integrates multiple business processes

Legacy system: System in place for long time

Middleware: Software that connects two disparate systems
Chapter 5: Types Of Software

A multitier architecture for e-commerce and e-business
Chapter 5: Types Of Software

Window on Technology

Application Integration to the Rescue

How can enterprise application integration and Web services technology provide value for organizations?

What management, organization, and technology issues should be addressed when making the decision about whether to use these technologies?
Chapter 5: Types Of Software

Hardware Technology Requirements
For Electronic Commerce and the Digital Firm

Capacity planning: Process of predicting when a computer hardware system becomes saturated

Scalability: Ability of a computer, product, or system to expand to serve a larger number of users without breaking down
Chapter 5: Types Of Software

Total Cost of Ownership (TCO) of Technology Assets

- Hardware acquisition
- Software acquisition
- Installation
- Training
- Support
- Maintenance
- Infrastructure
- Downtime
- Space and energy
Chapter 5: Types Of Software

Rent or Build Decisions: Using Technology Service Providers

Storage service provider: Provides online access to storage devices and storage area network technology

Application service provider: Delivers applications over networks on subscription basis

Management service provider: Manages applications, systems, security, storage, Web sites, system performance
Chapter 5: Types Of Software

Model of an Application Service Provider (ASP)
Chapter 6: Telecommunications

Business Applications of Telecommunication

- **Telecommunication**
  - Sending of information in any form (voice, data, text, and images) from one place to another using electronic or light-emitting media.

- **Data communication**
  - Transmitting and receiving of data over communication links between one or more computer system and a variety of input/output terminals.
Business Telecommunications

Telecommunications Network

- The Internet
- Intranets
- Extranets
- Client/Server networks
- Other network

Enterprise Collaboration System
- Electronic mail
- Voice mail
- Discussion forums
- Data conferencing
- Voice conferencing
- Video conferencing

Electronic Commerce System
- Online POS system
- Web retailing & wholesaling
- Interactive marketing
- Electronic funds transfer
- Electronic banking

Internal Business System
- Internal transaction processing
- Inquiry processing
- Intranet web publishing
- Workflow systems
- Management support system
(a) Enterprise collaboration applications

* Use telecommunications network to support communication, coordination, and collaboration among the members of business teams and workgroup.

(b) Electronic commerce

* Support the buying and selling of products, services, and information, over the internet, and other computer networks.

(c) Internal business applications

* Depends on variety of computer network to support a company’s business operation.
The Business value of telecommunication

* Overcome geographic
  - Capture information about business transactions from remote locations

* Overcome time
  - Provide information to remote location immediately after it’s requested

* Overcome cost
  - Reduce cost

* Overcome structural barrier
  - Support linkages for competitive e advantage

Trends in Telecommunication
(a) Industry Trends
(b) Technology Trends
(c) Application Trends
The Internet Revolution

- Explosive growth of internet is the revolutionary technology phenomenon in 1990s.
- More business and more organizations and their users, computers and networks join its global web.
- The internet has become a key platform for a rapidly expanding list of information and entertainment services and business applications.
- The internet evolved from a research and development network (ARPANET) established in 1969 by the U.S. Defense Department to enable corporate, academic, and government researches to communicate with E-mail and share data and computing resources.
- The Net doesn’t have a central computer system or telecommunications center. Instead each message sent has a unique address code so any Internet server in the network can forward it to the destination.
**Internet Application**

- One of the most important and popular uses of the Internet is gathering information. We can make online searches for information in a variety of ways using web browser and search engine such as Yahoo!, Alta Vista, Excite, InfoSeek, Google and so on.

**The Information Superhighway**

- In this concept, local, regional, nationwide and global networks will be integrated into a vast network of networks with more advanced interactive multimedia capabilities than then Internet.

- The Information Superhighway system would connect individuals, household, business, news, entertainment media, government agencies, libraries, universities and so on and would support interactive voice, data, video and multimedia communications.
A Telecommunication Network Model

- A communication network is where a sender transmits/send a message to a receiver over a channel consisting of some type of medium.

- 5 basic components of some type of medium.

(a) Terminal
   * Any Input / Output devices that uses telecommunications network to transmit. Ex: telephone, PC, network computer. They can convert data from digital to analog, control the speed, accuracy and efficiency.

(b) Telecommunications Processor
   * Support data transmission and reception between terminals and computer.
(c) Telecommunications Channels
   * Data are transmitted and received (Ex: Copper wires, coaxial cable, and so on)

(d) Computers
   * All sizes and types are interconnected by telecommunications network so that they can carry out the information processing assignments.

(e) Telecommunications Control software
   * Programs that control telecommunications activities and manage the function of telecommunication network.
Five basic components in a telecommunications network
Types of Telecommunication Network

(a) Local Area Networks (LANs)

* Connect computers and other information processing devices within a limited physical area such as an office, a classroom, a building, or a manufacturing plan.
Types of Telecommunication Network

(b) Wide Area Networks (WANs)
* Networks that cover a large city or metropolitan area.
* For ex: WANs are used by many multinational companies to transmit and receive information among their employees, customers, suppliers and other organization across cities, regions, countries and the world.
Types of Telecommunication Network

(c) Internetworks

* This network enable end users to communicate with the workstation of colleagues on other LANs, or to access the computing resources and database at other company locations or other organizations.
(c) Internetworks
* These interconnected telecommunications networks rely on internetwork processor (for ex: switches, routers, hubs) to make internetworking connections to other LANs and WANs.
Chapter 7: Information Systems for Business Operations
(a) Cross-Functional of Information System

- This system support business processes, such as product development, production, distribution, order management, customer support and so on.

- They view this system as a strategic way to use IT to share information resources and improve the efficiency and effectiveness of business processes.

(b) Marketing Information System

- Planning, promotion, and sale of existing products in existing markets, and the development of new products and new market.

(i) Interactive Marketing (Type of marketing that is based on using internet, intranets, and extranets)

(ii) Sales & Product Management (Use analysis report to help marketing managers to monitor the sales performance of products and salespeople and help them to develop sales support programs)

(iii) Advertising and Promotion (Maximize sales at the lowest possible costs for advertising and promotions)

(iv) Market Research and Forecasting (Collect, analyze and maintain information subject to the change of market demand)
(c) Manufacturing Information System

-Used for operations management and transaction processing support all firms to plan, monitor, and control inventories, purchases and flow of goods and services. Ex: transportation companies, wholesalers and retailers.

(i) Computer Integrated Manufacturing (Simplify, Automate, Integrate)
(ii) Collaborative Manufacturing Networks (Links employees, and suppliers from different location)
(iii) Process Control (Use of special sensing devices that measure physical phenomenon ie: temperature or pressure changes)
(iv) Machine Control (Engineers to fine-tune machine tool performance)
(v) Robotics (Machine that control their own activities with the help of microcomputers)

(d) Human Resource Information System

-Involves the recruitment, placement, evaluation, compensations and development of the employees of an organization.

(i) HRM and the Internet (Recruiting and advertising, E-mailing)
(ii) HRM and corporate intranet (To retrieve HRM files internally)
(iii) Staffing the organization (Adding new and deleting employees)
(iv) Training and development (Can be used to analyze the success history of present program)
(v) Compensation analysis (Wages, salaries, incentive payment, fringe benefits)
(e) Accounting Information System
- Used for double-entry bookkeeping, order processing, inventory control, accounts receivable, accounts payable, payroll, balance sheets and income statements

(i) Online Accounting System
(ii) Order Processing
(iii) Inventory Control
(iv) Accounts Receivable (Keep records of amounts owed by customers)
(v) Accounts Payable (Payments for outstanding invoices for suppliers and others)
(vi) Payroll (Produce paychecks, and other documents ie: earning statements, payroll reports, and labor analysis report)
(vii) General Ledger (Consolidate data received from AP, AR, GL, payroll and etc)

(e) Financial Information System
- Cash, and investment management, capital budgeting, financial forecasting, and financial planning.
- Support financial managers in decision making on financing a business, the control of financial resources within a business.

(i) Cash Management (Investment)
(ii) Online Investment Management (Help manager to minimizes risk and maximizes investment income for the business)
(iii) Capital Budgeting (Long term expenditure proposals for plants and equipment )
(iv) Financial Forecasting and planning (Help to analyze alternative methods of financing)
Transaction Processing Systems

- Process data resulting from the occurrence of business transaction.
- Transactions are events that occur as part of doing business ie: sales, purchases, deposits, withdrawals, refunds and payments.
- The transaction processing cycle involved:

(a) Data entry activities
(b) Transaction processing activities
(c) Files and database processing activities
(d) Document and report generation
(e) Inquiry processing activities

1. Data entry activities
   (i) Traditional data entry
   - Accumulates data in batches basis before updating to the master file / database.
   - This has being replaced with source data automation using source data machine ie: ATMs, Optical Character Recognition (OCR) and transaction terminals such as POS terminals & others.
   - Source data automation capture data directly without the use of media by optical scanning of bar code packaging.
2. **Transaction processing activities**
   a) **Batch processing**
      - Transaction data are accumulated over a period of time and processed periodically.
      - **Advantage:**
        * Economical method when processing large volume of transaction data.
      - **Disadvantages:**
        * Master file are out-of-date
        * Immediate updated responses to inquiries cannot be made
   
   b) **Real time processing**
      - Allows transaction data to be processed immediately after they are generated and can provide immediate output to end users.
      - **Advantage:**
        * Real-time processing provides immediate updating of databases and immediate responses to user inquiries.
      - **Disadvantage:**
        * More controls have to be built into the software and network procedures to protect against unauthorized access.
3. **Files and database processing activities**
   - A major activity in transaction processing.
   - Transaction processing system update the corporate databases of an organizations to reflect any changes resulting from day-to-day business transaction.

4. **Document and report generation**
   - Final stage of transaction processing cycle.
   - Documents produced by transaction processing systems are called transaction documents.

5. **Inquiry processing activities**
   - Can be provided by either batch or real time processing.
   - End users can use database management query language to make inquiries and receive responses concerning the results of transaction activity.
   - Responses are displayed in a variety of perspecified formats or screens.