

## *Chapter Overview*

This chapter deals with the definition of system and its environment, meaning of the term sub-system, characteristics of information and some types of business information systems.

### **MAJOR TOPICS/SUB-HEADS**

- I. Definition of a System
- II. System Environment
- III. Types of Systems
- IV. Methods of building Systems from Sub-Systems (i.e. Building blocks)
- V. Meaning of the term Information
- VI. Characteristics of Information & Value of Information
- VII. Meaning of Business Information Systems & its types

## I. DEFINITION OF A SYSTEM

A system could be defined as:

- A set of inter-related components (What it is)
- Operates collectively (How it operates)
- To accomplish common goals (Its purpose)

Let us take some examples to understand the term System

**Example 1:** Business systems

**Components :** Men, material, money, machine - work collectively for:



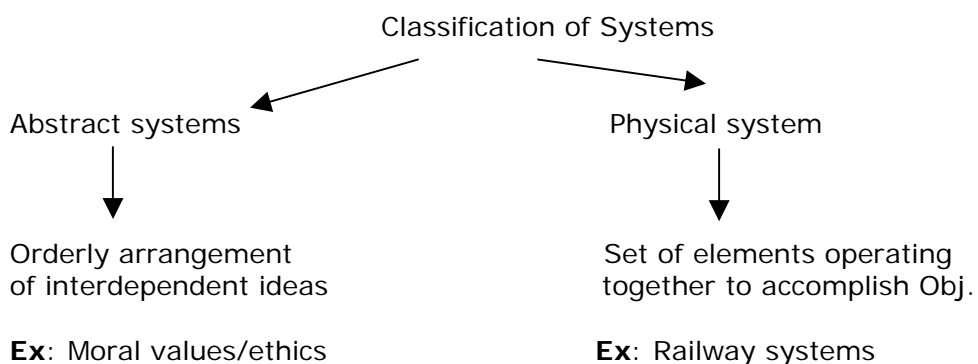
**Common goal:** Profits/market share

**Example 2:** Computer based information systems

**Components:** Hardware, software, data, people - operate collectively for:



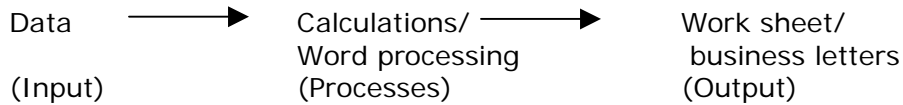
**Common goal :** Providing timely information to authorised users



### General model of a physical system

Input → Processes → Output

**Ex:** Computer information systems

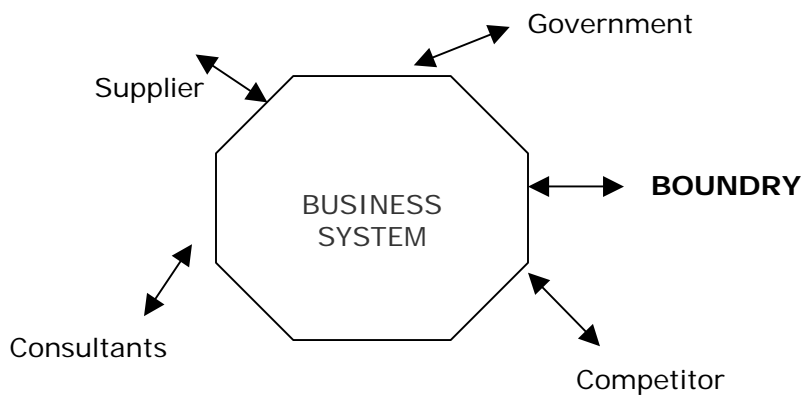


## II. SYSTEMS ENVIRONMENT

It can be defined as:

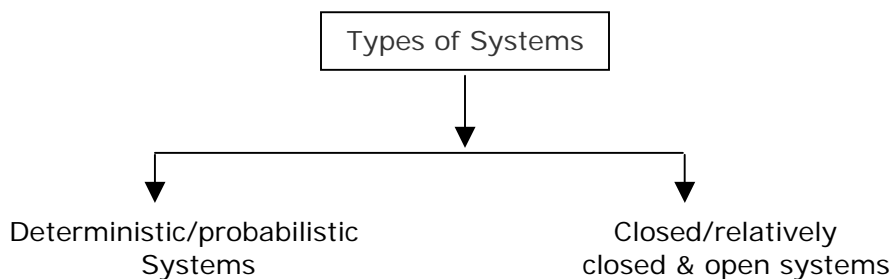
- Elements surrounding the system
- That are outside the system and interact with the system

**Example:** Environment of a business system.



**Boundary:** Features which define and delineate (separate) a system from its environment- forms its boundary

## III. TYPES OF SYSTEMS



### 1. **Deterministic systems:**

- Operates in a predictable manner
- Interaction among parts known with certainty
- **Ex:** Calculator has programmed logic for addition /subtraction

## 2. **Probabilistic systems:**

- Systems have a probable behaviour
- A degree of uncertainty or error is attached to what a system would do
- **Ex:** Human system- some degree of uncertainty as to how he will behave in a given circumstance

## 3. **Closed systems:** Such systems are:

- Self contained
- Donot interact with environment
- Tend to degenerate
- **Ex:** Any government if it fails to interact with people & get its views/sensitive to public opinion will be voted out of power

## 4. **Relatively closed systems/isolated systems:**

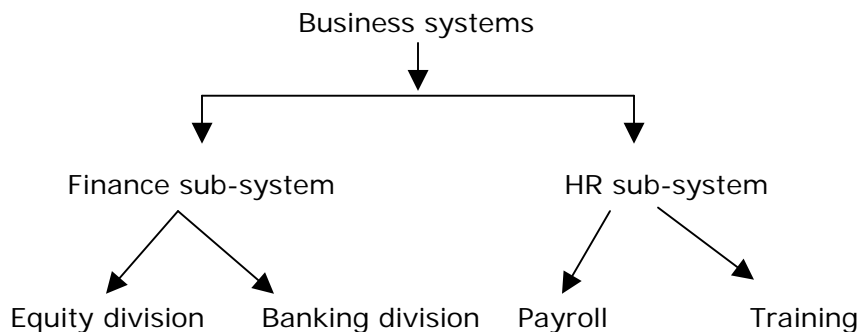
- Deliberately designed to be as closed as possible
- Intention is to prevent unwanted influence from environment
- **Ex:** Computer program accepts only pre-defined input, processes them and gives pre-defined outputs.

## 5. **Open systems:**

- Interacts with the external environment, receives input and gives output
- Tends to adapt to changes in external environment for survival and growth

## IV. **SUB-SYSTEMS**

These refer to parts/building blocks of larger systems. For example the sub-systems of a Business System are as follows:



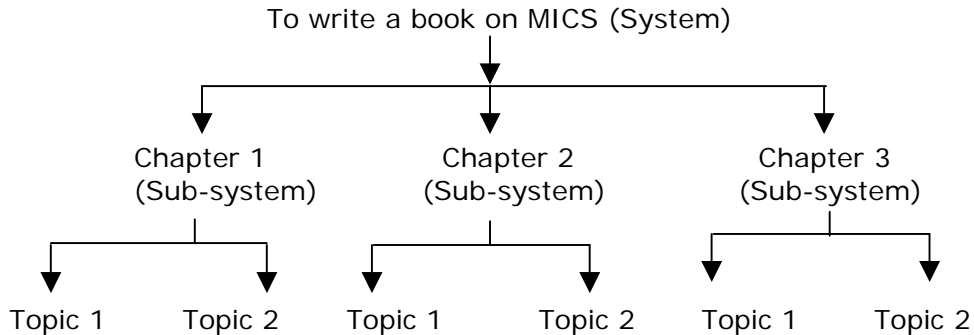
**Supra systems:** Formed by a system and equivalent systems with which it interacts.

**Ex :** Any Bank can be looked up as a supra-system it interacts with various other Banks

**Principles/ methods of building system from sub-systems:** The following are some the principles/methods to be followed while constructing a system from its sub-systems :

### A. Decomposition:

A complex system is difficult to understand. Hence break it up/decompose it into smaller identifiable blocks (sub-systems). Let us take an example of writing a book on MICS.



- Decompose the book into chapters- Chap.1, Chap.2 ...
- Decompose the chapter into topics- Chap.1- Topic 1, Topic 2  
Chap.2- Topic 1, Topic 2, and Topic 3 etc.

There should be functional cohesion among components: i.e. to say in the above case the topics within the chapters should be related to justify grouping under the same chapter, and then all the chapters should be related to MICS to justify their place in the book on MICS.

### B. Simplification

It refers to organising the sub-systems in such a manner so as to reduce the number of interactions.

How is simplification done?

- Through clusters/groups of sub-systems which interact with each other and then a single interface with other sub-systems/clusters

**Ex:** A Firm of Chartered Accountants can be looked up as a system and different divisions like audit, taxation and company law matters can be looked up as sub-systems.

Members of each division interact among themselves and are represented to the client/IT department/ CLB through a partner, who is a single interface.

### C. Preventing system entropy (preventing unavailability)

- Entropy prevented through inputs to repair, replenish and maintain systems
- Such maintenance inputs are called as **“Negative Entropy”**

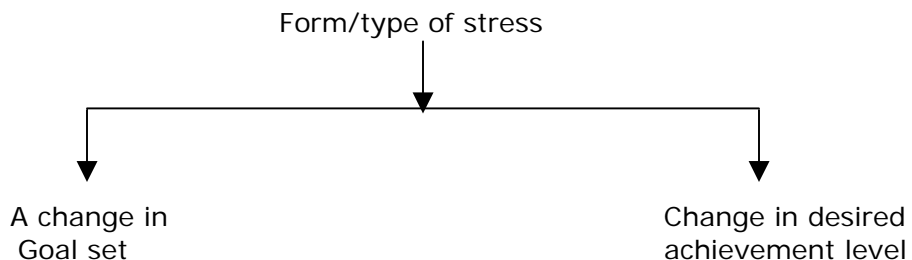
<i>System</i>	<i>Impact of entropy</i>	<i>Negative entropy (Maintenance input)</i>
1. Computer Application	i. Fails to meet user Requirement ii. Errors	Program modifications, enhancements Debug/repair programs
2. Electrical utility co.	i. Power thefts ii. Increase in demand	Shielded wires/ spot checks Extended wiring
3. Cellular operator	i. Wrong billing	Testing of billing software

### D. System stress & system change

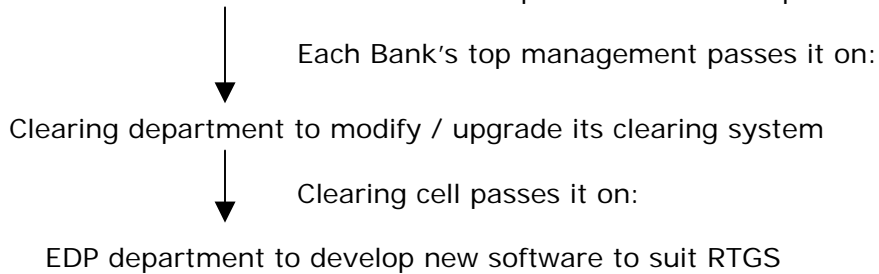
#### Stress:

- Meaning : Force transmitted by systems' supra-system
- Effect : Causes system to change
- Purpose : To enable supra system to better achieve its goals

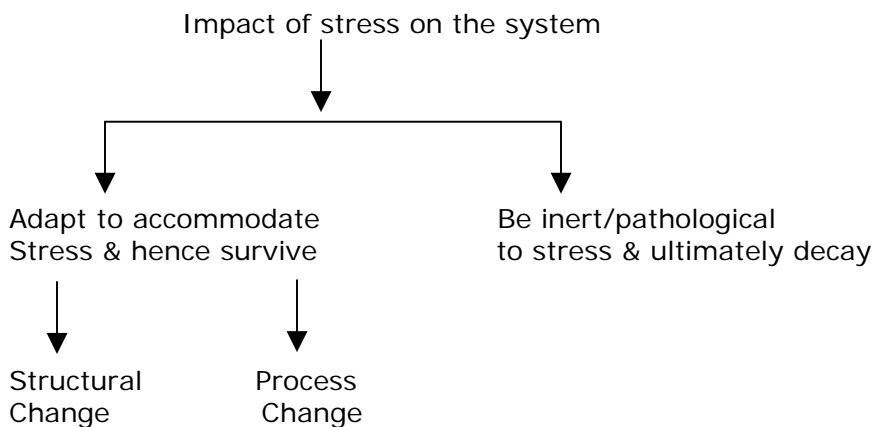
Each level of system trying to accommodate stress – may impose stress on its sub-system and so on.....



**Ex:** RBI Directive to all member Banks to implement RTGS/cheque truncation



**Impact of Stress on a system:** The impact of stress varies depending on whether a system reacts or does not react to stress.



## V. INFORMATION

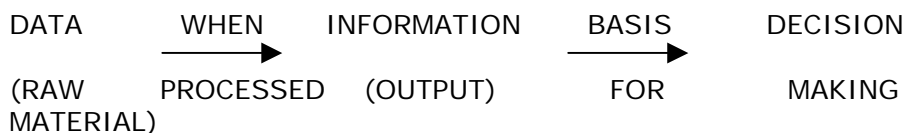
It refers to data that have been put to meaningful use/context

**Ex:** School management wants to know which subject/students require more attention

**Data available:** Marks of all the students in 5 subjects

**Processed data:** Tabulate the data and sort it / prepare %s to get better idea on performance.

Hence:



It may be noted that quality of data determines the quality of information and hence the quality of decisions

## VI. CHARACTERISTICS OF INFORMATION

1. **Timeliness** : Available when required
2. **Purpose** : Must have a purpose at the time of transmission
3. **Mode & format** : Mode- visual, verbal or written Format- so designed to assist decision making (**Ex:** Classified/ tabulated/ exceptions only )
4. **Redundancy** : Excess information per unit of data
5. **Rate** : Number of numeric characters /minute – for humans  
Number of bits/second – for machines
6. **Frequency** : Periodicity of information flow
7. **Completeness** : As complete/comprehensive as possible
8. **Reliability** : Source from which information originates should be reliable/ confidence level high
9. **Cost benefit analysis** : Benefits derived from using the information should justify cost of procuring the information
10. **Validity** : Information should close to the purpose it purports
11. **Quality** : Correctness (**Ex:** Without any personal bias)

### CONCEPT OF VALUE OF INFORMATION:

$$\begin{aligned}
 &= \text{VALUE OF "CHANGE IN DECISION / BEHAVIOUR" CAUSED BY INFORMATION} \quad \text{LESS} \quad \text{COST OF OBTAINING INFORMATION} \\
 &= \left\{ \begin{array}{l} \text{OUTCOME OF NEW DECISION} \\ \text{CAUSED BY INFO. (LESS)} \\ \text{OUTCOME OF OLD DECISION} \end{array} \right\} \quad \text{LESS} \quad \text{COST OF OBTAINING INFORMATION}
 \end{aligned}$$



**Example:**

- Mr. is approached directly by a prospective buyer to buy his house for Rs.50 lakhs (old decision)
- A real estate agent brings a new person who is willing to pay Rs 60 lakhs (new decision)
- Agent commission is 1% of sale value

Hence value of information given by the agent is :

$$\begin{aligned} &= \text{Rs.60 lakhs (less) Rs.50 lakhs ) less (1\% of 60 lakhs)} \\ &= 10 \text{ lakhs (less) Rs.60 Thousands} \\ &= \text{Rs.9.4 lakhs} \end{aligned}$$

It may be noted that the above example deals with value of information that has been calculated for change in revenue flows. Value of information can also be calculated for change in costs.

**VII. BUSINESS INFORMATION SYSTEMS (BIS)**

- Business systems depends on information systems
- BIS = Data flows/information flows among components of Business ( i.e. among various departments)
- Its purpose is to process input, maintain records and produce information output.

**Categories of information system*****i. Transaction processing systems***

- Aimed at meeting business functionality/business operations
- **Ex** : Billing software is aimed at improving routine business activity of billing

***ii. Management information system (MIS)***

- Assist management in decision making and problem solving
- Use results of transaction processing and other information
- Supports routine decisions
- **Ex**: Total sales data region wise from transaction processing – forms input for region wise sales analysis

**iii. Decision support systems (DSS)**

- For managers to solve unique/non-recurring/semi-structured decision problems
- Should have greater flexibility to meet uncertain environment
- Build problem models and alternate solutions explored
- **Ex:** “What –If” analysis in MS Excel

**Components of DSS software:**

USER INTERFACE + DATA BASE + MODEL BASE  
 (EASY TO USE QUERY LANGUAGE) (FOR DATA) (FOR BUILDING PROBLEM MODELS)

**iv. Executive information system (EIS)**

- Strategic levels of management pushed DSS to lower-levels of management because technical knowledge needed to build models and there was some difficulty in use

Hence EIS was introduced. It has the following characteristics / features:

- Easy to extract summary from data base and model complex problems
- Knowledge of complex query language was not required
- Ease of use / graphic representation
- Ability to incorporate data even from external/public databases
- Data “drill down” facility
- Externally focused/ strategically based

**v. Expert systems**

- To replace need of human experts where expertise is scarce and hence expensive (**Ex.** Rocket science, oil drilling, nuclear science )
- Specific to given area and cannot be generalised i.e. to say that an Expert System meant for oil drilling will not work in the area of nuclear science.
- It has resulted from academic research in the field of Artificial Intelligence (AI) .

## QUESTIONS

1. Define the term "System". What are the two broad classifications of systems? Explain with an example each.
2. What are the various types of systems? Explain with examples.
3. Write Short Notes on:
  - a. Systems Environment
  - b. System Entropy
  - c. System Boundary
  - d. System Stress
  - e. Sub-systems
  - f. System Change
  - g. Decision Support System (*Nov 2002*)
  - h. Decomposition (*May 2003*)
  - i. Simplification
  - j. Expert Systems (*May 2004*)
4. "Information to be useful and effective bears certain characteristics"- Explain
5. Explain the term value of information
6. Explain briefly the various categories of information systems. (*Nov. 2001*)