

Data ,Information, Knowledge and Wisdom :

Data is a collection of raw facts. The purpose of an information system is to process that collection of facts in some way, to produce information that is useful.

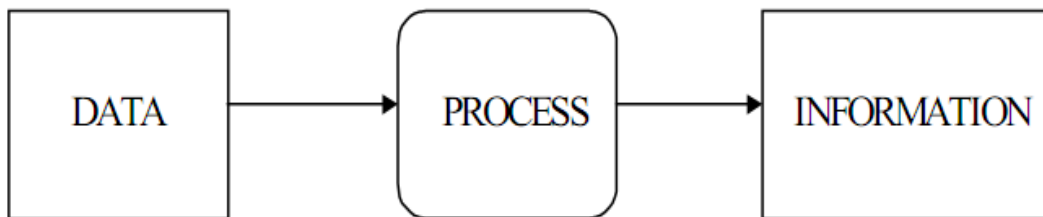


Figure 2-2: Transforming data into information

For example, if the telephone directory contained random names, addresses and telephone numbers, in no particular order, and with no logical association between names and phone numbers, it would be of no use to anybody. By sorting the list in alphabetical order of surname, information is produced.

Knowledge consists of many pieces of related information, and has a structure or organization whereby each piece of information is linked to others.

Finally, *wisdom* adds yet another dimension by combining knowledge with experience, and judgment.

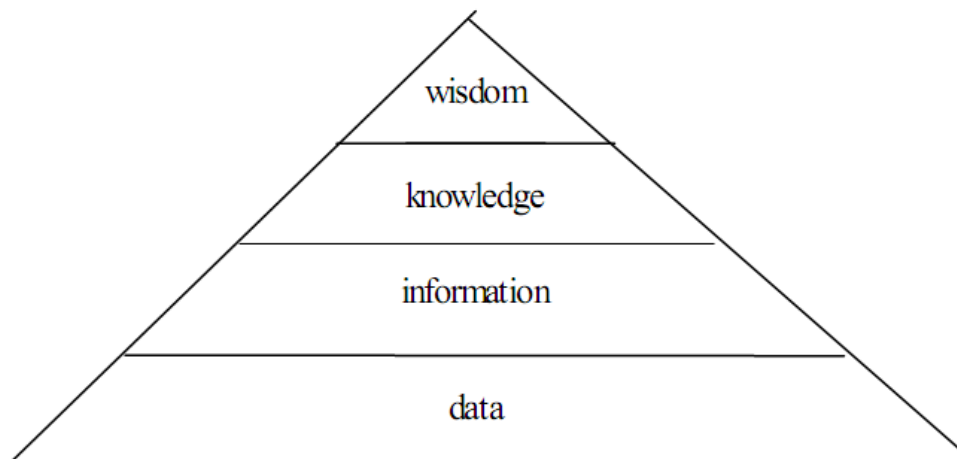


Figure 2-3: The hierarchy from data to wisdom

What is system?

A system is an organized assembly of components with special relationships between the components. The system does something, i.e. it has behavior or has a specific objective or purpose. Each component contributes specifically towards the behavior of the system and is affected by being in the system. If a component is removed, it will change the system behavior.

Elements of a System:

➤ **Environment and Boundary**

As soon as we identify a system, we define a *boundary*: what is inside the boundary belongs to the system; everything outside the boundary is not part of the system. However, most systems do not exist in isolation. Systems, or their components, inter-act with the world outside their

boundary. The part of the outside world with which the system interacts is called the *system's environment*.

➤ **Inputs, Transformation Process and Outputs**

The interactions of a system with its environment can take the form of inputs or outputs. *Inputs* take the form of material objects, energy and/or information flowing from the environment into the system. *Outputs* are released or sent from the system back into its environment. This output can either be useful (to some outside system) or waste. Within the system, the inputs usually undergo some kind of transformation process so that the outputs are different from the inputs. Often, inputs and outputs undergo further specific transformations at the system boundary; the system components responsible for these Transformations are called the *interfaces*.

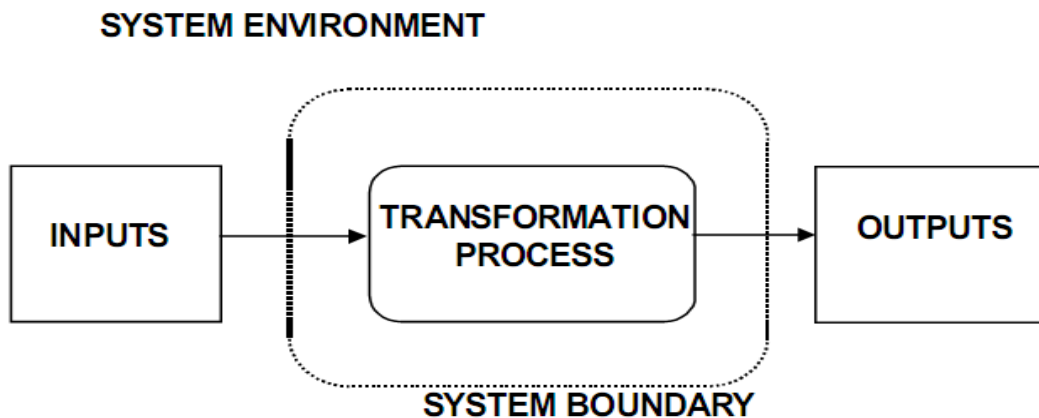


Figure 3-1: The basic elements of a system

Components and Subsystems:

A system consists of various components which, taken together, make up the system. The interaction between the system components is responsible for processing the inputs into outputs. Although components can also interact directly with elements from the environment i.e. across the system boundary, most of their interactions will be with other components within the same system. Often, components themselves can be viewed as smaller systems on their own: they are *sub-systems* of the system. In the case of an information system, the basic components that interact are

- The hardware or physical equipment used to process and store data.
- The software and procedures used to transform and extract information.
- The data that represents the activities.
- The network that permits the sharing of resources between computers.
- The people, who develop, and use the system.

Objectives, Control and Feedback Loops

Systems have a *function, goal or purpose*. In order for the system to achieve its goal(s), it needs to be able to modify its behavior. *Control* is the mechanism whereby special control signals or, when coming from outside the system, control inputs, modify the processes and activities which occur within the system.

The *controller* is the component or (sub-) system which exercises the control and can be part of or outside the system under consideration. The controller observes the behavior of the system, typically by looking at certain system outputs and compares them to the desired state or objective.

The 'round trip' of using output signals and using them to modify input signals is called a *feedback loop*, and the whole process is one of feedback Control.

Systems Concepts:

➤ **Open vs Closed Systems**

Any system that interacts with its environment is called an *open system*. There is in reality no such thing as a closed system, which would have no inputs or outputs and therefore, no environment.

➤ **Dynamic vs Static Systems**

A dynamic system is a system that has at least one (and usually many) activity or process; as opposed to a static system, which has no activity, whatsoever. Dynamic systems tend to become static, if a car is assumed to be a dynamic system, then it requires fuel to continue moving forward or else it would come to a stop and become static.

➤ **Continuous vs Discrete Systems**

If the system state changes over time continuously, then this system called a *continuous* system. A mercury-based thermometer, like many

physical systems, is a continuous system as the level of mercury rises or falls gradually with the environment's temperature.

Discrete systems are systems only concerned with what happens to the individual elements and will jump to that next step. A traffic light (robot) is a discrete traffic signaling system because its three lights (green, yellow or red) are either on or off.

Many electronic systems are a combination of both e.g. a digital thermometer has a sensor that records temperature as a continuous input but displays a temperature reading which has been rounded to the nearest degree.