Management Information Systems (MIS): General Introduction

When computers were first used in the mid-1950s, the applications were primarily the simple processing of transaction records and preparation of business documents and standard reports. This was termed Data Processing (DP) or Electronic Data Processing (EDP). By the mid-1960s, many users and builders of information processing systems developed a more comprehensive vision of what computers could do for organizations. This vision was termed as Management Information System (MIS). It enlarged the scope of data processing to add systems for supporting management and administrative activities including planning, scheduling, analysis and decision making.

In the 1980s and 1990s, there was a merging of computer and communications technologies. The organizational use of information technology was extended to Intranet (internal networks), Local Area Networks (LAN), external networks that connects an organization to its suppliers and customers, and communications systems that enable employees to work alone or in groups. Innovative applications of information technology created value by providing customized services at any time and at any location, and information systems began to prompt changes in organizational structures and processes. Although the scope of systems providing information technology services has increased dramatically, the broad concept of MIS as a system that combines transaction and operational requirements with administrative and management support remains valid. The term MIS is still in common use despite a recent tendency to use the simpler term **"Information Systems"**.

Before one can explain management information systems, the terms ***Systems, Data, Information, Knowledge, Wisdom,*** **and** ***Management*** must briefly be defined:

A system is a combination or arrangement of parts to form an integrated whole according to some common principles or rules. ***A system*** is a group of interrelated components working together toward a common goal by accepting inputs and producing outputs in an organized transformation process. It is an assembly of elements arranged in a local order to achieve certain objectives. The organization is also a system of people where people are selected on the basis of number, quality and ability and are placed in hierarchical order plan and execute the business activities to achieve certain goals and objectives. Such a system (sometimes called a dynamic system) has three basic interacting components or functions:

- **Input**: involves capturing and assembling elements that enter the system to be processed. For example, raw materials, energy, data, and human efforts must be secured and organized for processing.

- **Processing**: involves transformation process that converts input into output. Examples are a manufacturing process, or mathematical calculations.

- **Output:** involves transferring elements that have been produced by a transformation process to their ultimate destination. For example, finished products, human services, and management information must be transmitted to their human users.

Feedback and Control

A system with feedback and control components is sometimes called a cybernetic system, that is, a self-monitoring, self-regulating system.

- **Feedback** is data about the performance of a system. For example, data about sales performance is feedback to a sales manager.

- **Control** involves monitoring and evaluating feedback to determine whether a system is moving toward the achievement of its goal. The control function then makes necessary adjustments to a system's input and processing components to ensure that it produces proper output. For example, a sales manager exercises control when he or she reassigns salespersons to new sales territories after evaluating feedback about their sales performance.

Example: Organizations such as government agencies are good examples of the systems in society, which is their environment. Society contains a multitude of such systems, including individuals and their social, political, and economic institutions. Organizations themselves consist of many subsystems, such as departments, divisions, process teams, and other workgroups. Organizations are examples of open systems because they interface and interact with other systems in their environment. Finally, organizations are examples of adaptive systems, since they can modify themselves to meet the demands of a changing environment.

DIKW Hierarchy

DIKW refers to data, information, knowledge and wisdom; it is an information hierarchy where each layer adds certain attributes over and above the previous one. Data is the most basic level; Information adds context; Knowledge adds how to use it; and wisdom adds when to use it. This is the class of models for representing structural and functional relationships between data, information, knowledge, and wisdom, where the later is understood as ability to increase effectiveness and add value.

As such, DIKW is a model that is useful to understanding analysis and the importance and limits of conceptual works. Evaluated understanding (wisdom) is the only stage of DIKW evolution dealing with the future; this is the tool for decision making.

Data item refer to an elementary description of things, events, activities, and transactions that are recorded, classified, and stored, but not organized to convey any specific meeting. Data items can be numeric, alphanumeric, figures, sounds, or images. A student grade in a class is a data item, and so is the number of hours an employee worked in a certain week.

A single piece of data is called a datum. Unrelated items of data are considered to be essentially without meaning and are often described as 'noise'. It is only when data have been placed in some form of context that they become meaningful to a manager.

Data can exist naturally or can be created artificially. Naturally occurring data need only to be recorded. Managers have to put in place procedures and

tools to ensure data are recorded. For example, to ensure a call centre operator includes the postcode of every customer this can be written into their script and a validation check performed to check these data have been entered into the system. Artificial data are often produced as a by-product of process. Processing an organization's accounts, for example, might produce the number of sales made in a particular month.

Information is data that have been organized so that they have meaning and value to the recipient. For example, a student's grade point average is information. The recipient interprets the meaning and draws conclusions and implications from the data. Data items typically are processed into information by means of an application. Such processing represents a more specific use and a higher value-added than simple retrieval and summarization from a database. The application might be a Web-based inventory management system, a university online registration system, or an Internet-based buying and selling system.

Creating Information

Processing data is necessary to place them into a meaningful context so that they can be easily understood by the recipient. Figure 1 illustrates the conversion of data into information.

A number of different data processes can be used to transform data into information. Data processes are sometimes also known as ***"transformation processes"***. The next section describes a range of common data processes.

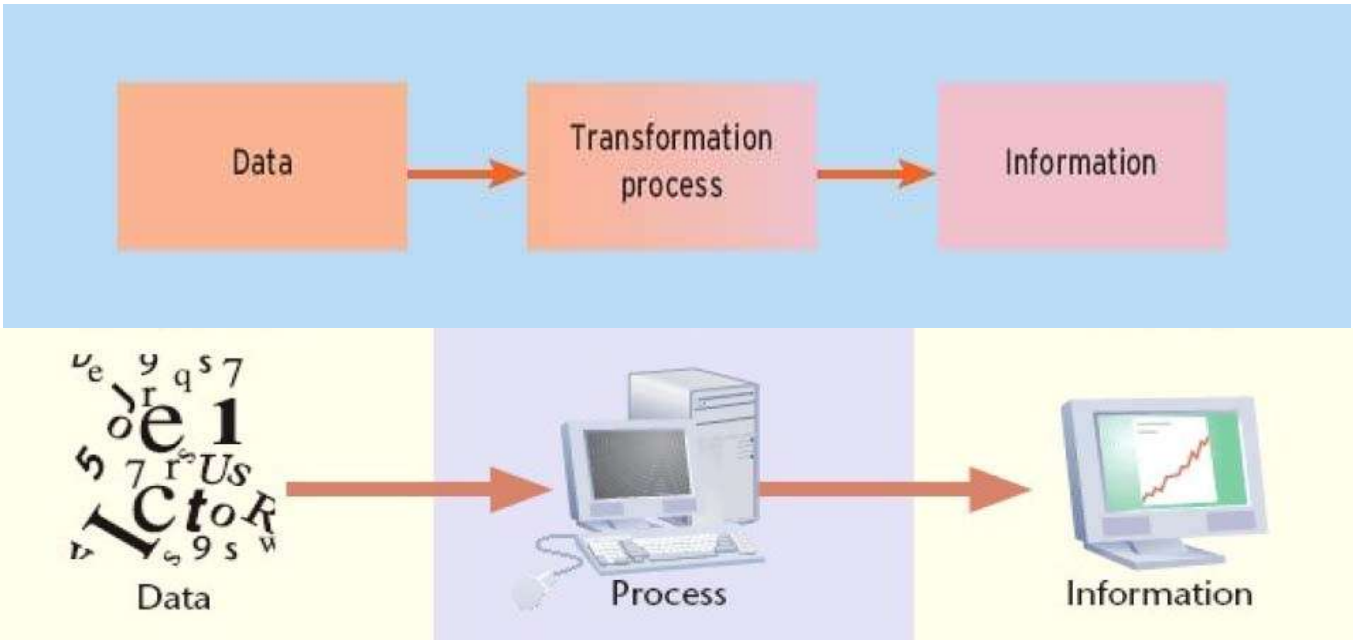

Figure 1: Transforming data into information using a data process

Data processes

Some examples of data processes include the following:

- **Classification**: This involves placing data into categories, for example categorizing an expense as either a fixed or a variable cost.
- **Rearranging/sorting**: This involves organizing data so that items are grouped together or placed into a particular order. Employee data, for example, might be sorted according to surname or payroll number.
- **Aggregating**: This involves summarizing data, for example by calculating averages, totals or subtotals.
- **Performing calculations**: An example might be calculating an employee's gross pay by multiplying the number of hours worked by the hourly rate of pay.

- **Selection**: This involves choosing or discarding items of data based on a set of selection criteria. A sales organization, for example, might create a list of potential customers by selecting those with incomes above a certain level.

It is worth noting that any action that serves to place data into a meaningful context can be considered a valid data process. In addition, several processes may be used in combination to produce information.

Knowledge consists of data and/or information that have been organized and processed to convey understanding, experience, accumulated learning, and expertise as they apply to a current problem or activity. Data that are processed to extract critical implications and to reflect past experiences and expertise provide the recipient with organizational knowledge, which has a very high potential value.

Data, information, and knowledge can be inputs to an information system, and they can also be outputs. For example, data about employees, their wages, and time worked are processed as inputs in order to produce an organization's payroll information (output). The payroll information itself can later be used as an input to another system that prepares a budget or advises management on salary scales.

Wisdom is an extrapolative and non-deterministic, non-probabilistic process. It calls upon all the previous levels of consciousness, and specifically upon special types of human programming (moral, ethical codes, etc.). It beckons to give us understanding about which there has previously been no

understanding, and in doing so, goes far beyond understanding itself. It is the essence of philosophical probing. Unlike the previous levels, it asks questions to which there is no (easily-achievable) answer, and in some cases, to which there can be no humanly-known answers period. Wisdom is therefore, the process by which we also discern, or judge, between right and wrong, good and bad. Many scientists believe that computers do not have, and will never have the ability to posses' wisdom. Wisdom is a uniquely human state, requires one to have a soul, for it resides as much in the heart as in the mind.

The following diagram represents the transitions from data, to information, to knowledge, and finally to wisdom.

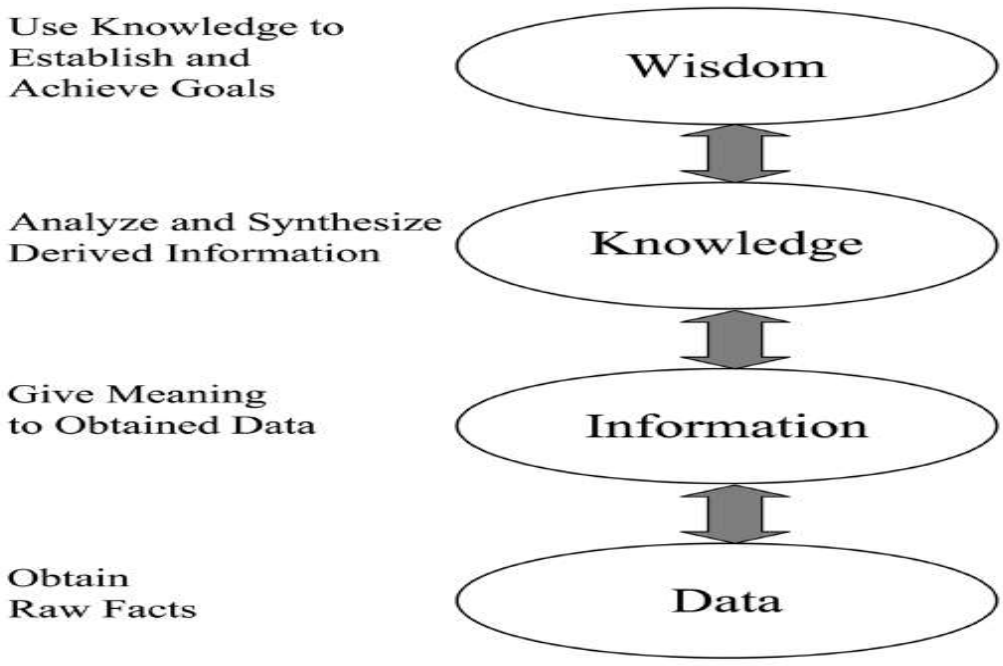

Figure 2: Data, information, knowledge and wisdom Framework

Table 1: Distinctions between data, information, knowledge and wisdom

Level	Definition	Learning process	Outcome
Data	Raw facts	Accumulating truths	Memorization (data bank)
Information	Meaningful, useful data	Giving form and functionality	Comprehension (information bank)
Knowledge	Clear understanding of information	Analysis and synthesis	Understanding (knowledge bank)
Wisdom	Using knowledge to establish and achieve goals	Discerning judgments and taking appropriate action	Better living/success (wisdom bank)

Management is usually defined as planning, organizing, directing, staffing and controlling the organization's operations. This definition, defines what a manager does, but it is probably more appropriate to define what management is rather than what management does. Management is the process of allocating an organization's inputs, including human and resources, by planning, organizing, directing, and controlling for the purpose of producing goods or services desired by customers so that organizational objectives are accomplished. If management has knowledge of the planning, organizing, directing, and controlling of the business, its decisions can be made on the basis of facts, and decisions are more accurate and timely as a result.