Information Technology (IT)

In the definition of information systems (I.S) no reference was made to any form of mechanization: it is a definition of how information is used rather than how it is obtained. In Information Technology (IT), processing is carried out with the assistance of machines (electronic machines).

IT is a computer – based information system (CBIS) in which the computer system plays a major role. All the various aspects of electronic technology include:

a. the use of microcomputers for the processing and storage of information;
b. the application of electronic spreadsheet to the modelling of business problems;
c. the use of word processing software for preparing standard reports and other correspondence at high speed;
d. the use of electronic-mail (e-mail) for transmitting messages. It partially eliminates the physical postal systems;
e. the introduction of electronic trading (e.g. e-commerce, e-marketing) and (electronic banking (which includes principally electronic money transfer); and
f. the introduction of electronic library enables the business to conduct its activities in a more efficient manner and stand above its competitors in the same trade.
g. electronic funds transfer. The means of transferring money from one bank account to another electronically.
h. data transmission.
i. The sending of data electronically from one place to another.

Type of Decisions

One major objective of the AIS is to provide information for management decision making. The IT aids AIS to meet this objective. To understand the roles played by IT and the design of such an AIS, we now explain the kinds of decision made by an organisation.

Decisions can be categorised either in terms of the degree of structure that exists or by the scope of the decision.

Categorisation by Decision Structures: Decisions vary in terms of the degree to which they are structured, among which are:

i. **Highly Structured Decisions:** They are repetitive routine and understood well enough that they can be delegated to lower level employees and in fact such decisions can be automated. For example, the decision to grant credit to established customers requires the following: Personal Identification Number (PIN); Customer credit limit, and Current balance.

ii. **Semi-Structured Decisions:** these are characterised by incomplete rules for making the decision. There is need for subjective assessment and judgements to supplement formal data analysis. Such decisions can be made using Computer Based Decision Aids such as Neural systems, Decision Support Systems (DSS),Executive Support System (EIS) etc. For example, setting a marketing budget for a new product requires: the marketing status of the other products; the level of advertisement and other subjective decisions.

iii. **Unstructured Decisions** are non-recurring and non-routine. Examples include choosing a cover for a magazine hiring a senior management the choice of basic research project to undertake.

In this case, no framework or model exists to solve such problems. Instead, they require considerable judgement and intuition. Nevertheless, they can be supported by Computer Based Decision aids that facilitate gathering information from diverse sources.

Categorisation by Decision Scopes: also decisions can be categorised based on the scope it covers. They are:

i. **Operational Decision:** this is concerned with the effective and efficient performance of specific tables. Lower-level supervisors and employers face semi-structured or structured decisions involving operational control. Examples include decisions relating to inventory/stocks management and extending credits.

ii. **Management Decision:** is concerned with the effective and efficient use of resources for accomplishing organisational objectives. Middle managers deal with semi-structured decision; involving management control. For example, budgeting, developing human resources practices, deciding on research projects and product improvement are management control activities.

iii. **Strategic Decision**: this is concerned with establishing organisational objectives and policies for accomplishing those objectives. Top management faces unstructured and semi-structured decisions involving strategic issues. Examples include: setting financial and accounting policies, developing new product lines and acquiring new businesses.

DATA REPRESENTATION IN A COMPUTER

The introduction of computer technology into information systems compels us to learn how data/information are transformed or coded to facilitate their storage and processing in the computer-based information system (CBIS).

Data can be in the form of alphabets, numbers and special symbols, which are all considered as characters in the computer.

For example, the character set includes

a. the 26 uppercase alphabets, A,B,C,D,E,….., Z;
b. the 26 lower case alphabets a,b,c,d,e,……,z;
c. the punctuation marks such as . , ; : (see the standard keyboard); and
d. the special symbols such as ! ^ * + - _
e. numbers

A number is composed of digits and there are 10 of such digits namely 0, 1 ,2, 3, 4, 5, 6,7, 8, 9 in the decimal number system. Examples of decimal numbers are 5.1, 126, 5897. A data that is a string of alphabets and numbers is called an alphanumeric data.

External and Internal Data Representation

External data representation: This is the representation of data in the usual normal language of the user. For example, the use of English alphabets to represent characters. When documents are presented for coding and processing, the data in the document is in external representation for the computer.

Internal Data Representation: Physical devices used to store and process data in computers are two-state devices as we have in:

i. Punched cards. The two states are the presence and absence of a hole on the card.
ii. Magnetic devices: The two states are achieved when a magnetic surface is magnetized in either one of two opposite directions.
iii. Conducting devices: The two states are achieved when the material is in conducting mode or non-conducting mode, as in semiconductors.

Thus, all data to be stored and processed in computer are transformed or coded as strings of two symbols, one symbol to represent each state. For convenience, let us denote the two different states by 0 and 1.

- In punched card phenomenon, 0 represents a punched hole and 1 represents not punched
- In magnetic devices, 0 represents magnetic poles aligned left to right (S $\longrightarrow$ N) magnetic poles and 1 represents magnetic pole aligned right to left (N $\longleftarrow$ S).
- In conducting devices (such as diodes) 0 represents conducting 1 represents non-conducting mode.
- In general, for any switch (i.e. a device that can exist in two states), let 0 represent OFF and 1 represent ON.

BIT: These two symbols 0 and 1 representing binary digits (base two numerals), each of which is called a BIT. Thus, a bit is the smallest unit of data in a computer system. The string of bits is then used to code data in a computer. The number of bits in each string will depend on the technology (i.e. architecture) of the computer involved. For example, in a 2-bit computer, each character is represented by 2 bits. The possible characters then are 00 01 10 11. Thus, the maximum number of characters that can be processed by a 2-bit computer is 4, i.e. 2^2.

For a 3-bit computer, the maximum number of characters that can be processed will be $2^3 = 8$, and the possible unique representation of the characters is 000 001 010 011 100 101 110 111

For a 4-bit computer, the maximum number of characters that can be processed will be $2^4 = 16$ and the possible unique representation of the characters is

0000 0001 0010 0011 0100 0101

0110 0111 1000 1001 1010 1011

1100 1101 1110 1111

In the normal usage of data, there are 26 upper case alphabets; 26 lower case alphabets; 10 decimal number digits; and possibly 36 other special characters. Hence, in standard usage of data, we need a computer that can process at least (26 + 26 +10 + 36) = 98 unique characters.

For such an n-bit computer, $2^n > 98$ and n = 7 since

$2^7 = 128$ and $2^6 = 64$.

Hence a computer in which each unique character is represented by a string of 7 bits is adequate to code the 98 characters in normal usage.

In order to facilitate the exchange of recorded data between computers, coding of characters has been standardized. The standard coding form in which each character is coded using 7 bits is known as ASCII (American standard code for information interchange).

Another standard coding form developed by International Business machines corporation (IBM) in which each character is coded using 8 bits is known as EBCDIC (Extended Binary coded Decimal Interchange Code.

In the case of BCD (Binary coded Decimal) coding form, each character is coded using a string of 4 bits.

A byte is a string of bits used to represent a character. For the BCD, a byte is made up of 4 bits. For the ASCII, a byte is made up of 7 bits while for the EBCDIC a byte is made up of 8 bits.

Definition of a Byte: In normal practice, a byte is defined as consisting of 8 bits i.e. 1 byte = 8 bits. This is the standard definition of a byte. It is a representation of a character which could be an alphabet, digit, or special character, ie a character is made up of 8 bits.

A **Word** is defined as a combination of 2 bytes. i.e. 1 word = 2 bytes

In information technology, $2^{10} = 1024$ is called a kilo.

We now present higher dimensions of the byte

2^{10} bytes = 1Kilobyte = 1 KB

2^{20} bytes = 1 Megabyte = 1MB

2^{30} bytes = 1 Gigabyte = 1 GB

2^{40} GB = 1 Terabyte = 1 TB

Representation of Integers

Decimal integers are also represented in the computer in the binary form as a string of bits. A number in binary form is said to be in base 2. Given a binary equivalent of a data (i.e. character or number), the leftmost bit is called the most significant bit while the rightmost bit is called the least significant bit.

For example, in 10010 the leftmost bit 1 is the most significant bit while the rightmost bit 0 is the least significant bit. Conversion of decimal numbers to binary numbers and vice versa is done automatically by the computer. Let us illustrate how this is done manually.

Conversion is done by dividing the given number by 2 continuously and recording the remainder**.** The remainders are written out from down up. While for decimals (0.25, 0.50 etc.) or decimal part of a number, the decimal is continuously multiplied by 2, until the answer becomes 1.0.

Example 1: Convert the decimal number 43.25 to a binary number.

2	**43**			2	X	0.25	= 0.5
2	21	R1	↑	2	X	0.50	= ↓1.0
2	10	R1	↑				
2	5	R0	↑				
2	2	R1	↑				
2	1	R0	↑				
	0	R1	↑				

Hence $43.25_{10} = 101011.01_2$

Conversion of binary numbers to Decimal numbers

A binary number is converted to a decimal number by attaching weights to each position and sum the products of the weights and the bits. The weights are 2^0, 2^1, 2^2, 2^3, 2^4, etc. starting from the right most bit to the leftmost bit. Then immediately after the decimal point (if any) weights are attached from 2^{-1}, 2^{-2}, 2^{-3} etc. from the leftmost decimal digit to the rightmost.

For example convert 101011.01_{two} to base ten.

$$1 \text{ X } 2^5 + 0 \text{ X } 2^4 + 1 \text{ X } 2^3 + 0 \text{ X } 2^2 + 1 \text{ X } 2^1 + 1 \text{ X } 2^0 + 0 \text{ X } 2^{-1} + 1 \text{ X } 2^{-2}$$

= 32 + 0 + 8 + 0 + 2 + 1 + 0 + 0.25 = 43.25

Elements of a Database

Field

Definition of a Field: A field is a data item or value that contains one of more related characters. The field may denote a name, a value a number or an operator**.** Examples are Joshua – he name of a person consist of the following 6 characters; J O S H U A

Records

Definition of a Record: A record consist of one or more fields, which are normally treated together as a unit when dealing with a file, which can be accessed through a (KEY). For example, information about scores of a student in an examination might constitute a record, with the student's identification number serving as the KEY.

File

Definition of a File: A file is a collection of related records. For example, a record of all Accounting students in a particular class.

Database

Definition of a Database: A Database is a collection of interrelated files. For example the files of each of our customers are stored in one database. Debtors' files – This consists of records of customers who are owing the company. For each customer, the customer name or PIN is the Key which is a unique identifier of the customer. Each of this item is a BYTE and each BYTE is made up of BITs.