Course: Professional Issues in Information Technology

Week 2: Introduction to Data Processing

Lecturer: Martha Gichuki

Lecture learning outcomes

At the end of this lecture, the learner should be able to:

(i) Distinguish Data from Information

(ii) Describe the Data Processing Cycle

(iii) Describe the characteristics and features of Information

Introduction to Data Processing

1.1 Definition of terms:

1.1.1 Data

- Data refers to raw facts about an entity e.g. transactions in an organization
- Data is a collection of non-random facts/symbols recorded by observation or research representing quantities, actions, objects etc.[1]
- Examples of data items include: measurements taken on a production line, records of business transactions, student scores in an examination etc.

1.1.2 Data Processing

- Data processing involves collecting and organizing data items / symbols and converting them into a more meaningful format (information)[2]
- Data that is relevant to information processing and decision making may also come in the form of text, images or voice.
- Effective data processing requires data and other resources such as human personnel, facilities and equipment.

[1]https://www.studocu.com/row/document/university-of-nairobi/information-communication-technology/data-processing-notes/21247785

[2]https://www.studocu.com/row/document/university-of-nairobi/information-communication-technology/data-processing-notes/21247785

Examples of data processing activities:

- Classification –placing data into categories
- Sorting –re-arranging / organizing / grouping data items together or placing them in a particular order e.g. ascending or descending order
- Aggregating –summarizing the data e.g. calculating averages, totals etc.
- Manipulating –performing calculations on the data e.g. Gross Pay=Basic Pay + Allowances
- Selection –choosing or discarding items of data based on a set of selection criteria

1.1.3 Information

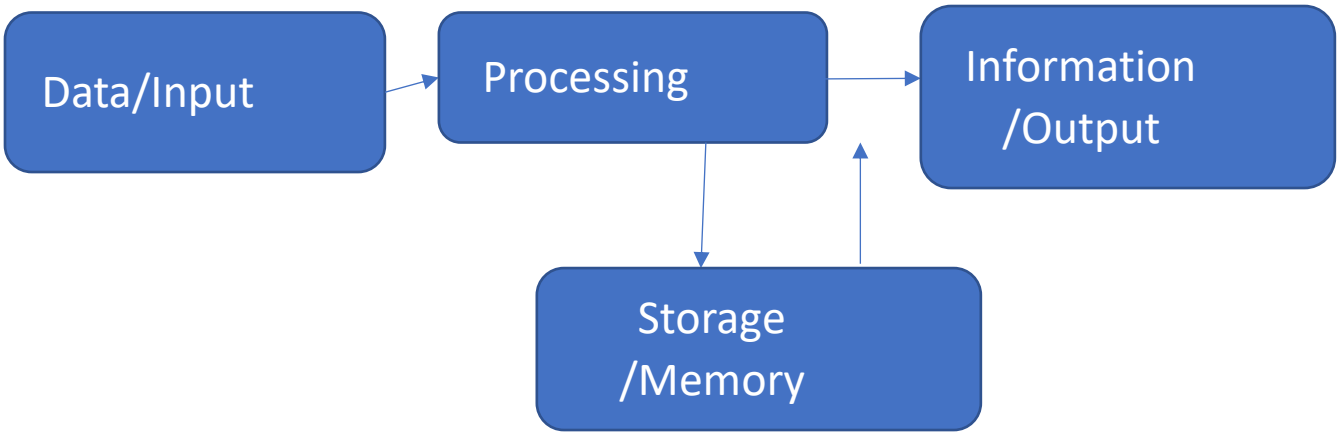
- Information is processed data; data that has been transformed into a meaningful format useful for the recipient to use in decision making[3]
- Therefore, information refers to organized ideas or facts obtained through processing data and can be used in decision making
- Data that is gathered, classified, organized, processed or manipulated into a meaningful format adds real value to current or future decision making.
- Organized ideas or facts obtained through data processing and can be used in decision making
- Information is communicated knowledge about some facts, events, subjects, etc.
- Result of modeling, formatting, organizing or converting data to increase knowledge of the recipient.

[3]https://www.studocu.com/row/document/university-of-nairobi/information-communication-technology/data-processing-notes/21247785

2.1 Data Processing Cycle:

2.1.1. How is data related to information?

The relationship is similar to that of converting raw materials to finished products in the sense that an Information System processes data into information.



Data Processing Cycle: - *Source: https://www.studocu.com/row/document/university-of-nairobi/information-communication-technology/data-processing-notes/21247785*

Step 1 - Data Gathering - This includes observing, capturing and gathering facts/symbols together and organizing them for processing purposes.
Step 2 - Processing - The captured facts and symbols are put in a medium, manipulated and altered accordingly.
Step 3 - Storage - Some medium is used for keeping the symbols / information for later retrieval and use.
Step 4 - Dissemination and Usage - Retrieving the symbols and converting them into a suitable format for distribution via space and time to the people who need them

2.1.2 Characteristics of Information

Three information attributes improve the quality of information. These are t**ime, content and form**. These attributes are further classified into several dimensions as shown below: -

1. **Time dimension –** The period that the information deals with and the frequency at which the information is received. Time dimension elements include: -
   - ✓ **Timeliness** – Availability when needed
   - ✓ **Currency** – Reflecting current circumstances
   - ✓ **Frequency** – Availability as frequently as needed e.g. supplied at regular intervals; hourly, daily, monthly etc.
   - ✓ **Time period** – Covering the right time period

2. **Content dimension –** The scope and substance of information. Content dimension elements include: -
   - ✓ **Accuracy** – Information needs to be free from errors
   - ✓ **Relevance** – Relates well with situation and meets the needs of the recipient
   - ✓ **Completeness** – Full without a compromise of other attributes
   - ✓ **Conciseness** – In the most compact form possible
   - ✓ **Scope** – Appropriate to meet user needs

3. **Form dimension -** How the information is presented to the recipient. Form dimension elements include: -
   - ✓ **Clarity** - Easy to locate specific items quickly and understand them easily
   - • **Details** - Contains correct level of features
   - • **Order** - Provided in the correct order to aid in decision making
   - • **Presentation** – Portrayed in the appropriate format
   - • **Media** - Presented using correct medium

In conclusion, 'good' information is: -

- **Pertinent** - Information statements must relate to the business at hand and to the commitments that need to be made.
- **Timely** - Availability when needed.
- **Accurate** – has meaning that prompts actions on situation / context it is used
- **Reduces uncertainty** –Reduces the unknown about an identity without any element of surprises

2.2 Properties of Information

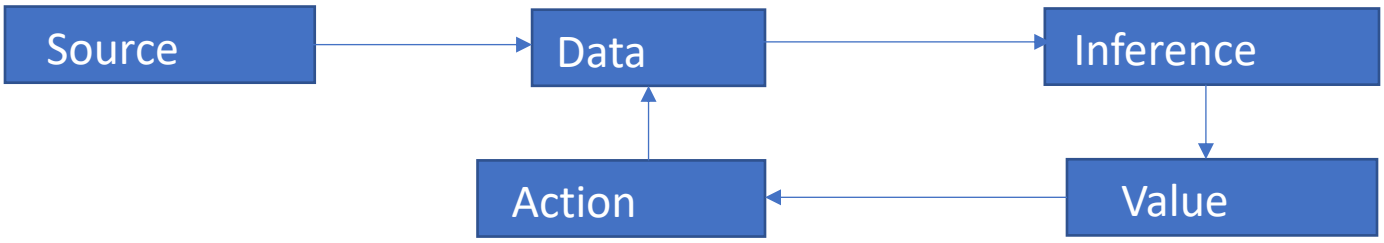
- Ability to be stored or contained in various media: books, files, etc.
- It may be **communicated** using various channels
- It may be obtained (defined) by processing data;
- Information is a symbolic representation of past, present or future events/objects (presence or absence)
- Information is meaningful if it can be used and therefore has value.
- The main function of information is to aid managers in planning, coordinating and controlling activities in an organization i.e. all decision-making activities.

2.3 Where does Information come from?

- **Various Sources e.g.** people, events, physical activities and objects that are relevant
- **Processing data -** Data from any source, which when processed generate information
- **Knowledge -** Information that has to be authenticated, validated or thought to be true before it is used for decision making or influence behavior.
- **Wisdom -** knowledge that has been integrated in the culture, society or value system.
- **Articulation** – drawing relationships among minds / sources in a given situation.

2.4 Information Value Adding Chain

a) **Source** - people, events, physical activities and objects relevant to the decision maker
b) **Data** - observations, measurements and recording from source
c) **Interpretation** – drawing inferences, predictions and analysis from data by applying assumptions and perspectives
d) **Value -** evaluation of interpretation with respect to social, economic or political values of the decision maker and choosing a course of action
e) **Action** - engaging in the course of activity by an agent. Information value is derived from its potential or actual use.



Information Value Chain - Source:https://www.studocu.com/row/document/university-of-nairobi/information-communication-technology/data-processing-notes/21247785

- Information resources are reusable, they do not lose value and out of more usage they gain added value. The value of information becomes meaningful in the context of decision making. In the absence of current / future choices or decisions, information becomes unnecessary.

3.1 Features of Information

i. **Information is intangible**

- ✓ Essentially, information is human in its origin
- ✓ Information only exists in the human mind, i.e. what it can remember, can receive, analyses and integrate.
- ✓ Information is given and taken by the human mind.

ii. **It's expandable –**

- ✓ Information tends to expand with its use
- ✓ New relationships and possibilities are realized with information use and sharing.
- ✓ Expandability depends on the amount of time for giving and taking minds and the available capacity to observe, reflect analyze and integrate.

iii. **Information is compressible**

- ✓ Using special techniques, complex information can be compacted, consolidated, compiled, integrated and summarized.

iv. **Information is substitutable**

- ✓ Information can replace something like labor, capital or physical materials in most economic processes.
- ✓ Example E-Commerce replaces people (brings information warfare)

v. **Information is transportable**

- ✓ Information can be moved around the world today at high speeds through the internet

vi. **Information is diffusive –**

- ✓ Information is hard to contain and tends to outflow to those seeking it, who might use it for whatever purpose whether good or evil.
- ✓ This brings the issue of ethics and one unethical practice is the inability to contain flow of information to check privacy, confidentiality, secrecy etc.

vii. **Information is shareable –**

- ✓ Information is not depleted with use
- ✓ As it is with training, information is enhanced by use.
- ✓ Sharing can be enhanced by propaganda or advertising.

3.2 What is Information Technology?

- ✓ Technology refers to machines and how they are developed, the techniques used and the organizations that use them.
- ✓ Technology therefore implies both the tangible objects and the social relationships.
- ✓ **Information Technology** refers to the apparatus/machines used, the software that runs the machines to support the techniques involved in operation, management and use of these machines.

3.2.1 What is a system?

- A system is a group of components that interact to achieve a common purpose.
- Information is the structure of an entity that enables a person make a decision or a commitment.
- Technology liberates people but there are some technological applications that can dehumanize and de-skill people.[4]

3.2.2 What is an information system?

- This is an arrangement of people, data, processes and Information Technology that interact to support and improve business operations
- Information Systems support the problem solving and decision-making needs of the management and users.

3.2.3 Types of Information Systems

i. Management Information System (MIS)
ii. Expert System (ES)
iii. Executive Support Systems (ESS)
iv. Decision Support Systems (DSS)
v. Knowledge Base Systems (KBS)
vi. Office Automation Systems (OAS)
vii. Transaction Processing Systems (TPS)

[4]https://www.studocu.com/row/document/university-of-nairobi/information-communication-technology/data-processing-notes/21247785

Content Covered in Week 2: Introduction to Data Processing

(i) We have differentiated Data from Information
(ii) We have described the Data Processing Cycle
(iii) We have explored important characteristics and features of Information
(iv) We have introduced Information Systems

Course Text Books and Online Resources

1. Professional Issues in Information Technology. Bott, F. *British Computer Society, UK.* (2005)
2. Ethics in Information Technology, 4th ed. Reynolds, G. *Course Technology, Boston, USA.* (2011)
3. Computers in Society: Privacy, Ethics and the Internet. George, J.F. *Pearson Prentice Hall, New Jersey.* (2004)
4. Cyber-ethics: Morality and Law in Cyberspace, 5th ed., Spinello, R.A. *Jones & Bartlett, Burlington, Mass., USA.* (2013)
5. Contemporary Issues in Ethics and Information Technology. *Schultz, R.A. IRM Press, USA.* (2005)
6. https://www.studocu.com/row/document/university-of-nairobi/information-communication-technology/data-processing-notes/21247785