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The Role of Information Communication Technology (ICT) in the Management of Organizations

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ABSTRACT
Accurate, appropriate and timely information is very important in any human endeavor in today's world. The communication and processing of information whether in business Sciences, education or government, has become one of the world's major endeavors. Computers are indispensable in this effort. The invention of computer has enabled much work to be done fast and accurately. Computers are used in engineering, research, and business-cooperation, also in diverse fields such as education, crime prevention, traffic control, ecological studies, and many other social studies. Computers have been playing an increasing important role in practically everyone's life for the past quarters of the century it predicts the weather, provide balance sheets. Scrutinizes tax returns and payroll system, guides intercontinental missiles and performs innumerable other operations for governments and cooperation even in health sectors we have artificial doctors and also are use in laboratories, hence the important of processing and dissemination of information.

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INTRODUCTION

For the fact that computers are significantly affecting numerous functions in society (Laudon & Laudon, 2020; Verhoef et al., 2021), it is increasingly important for all individuals to possess at lease a conceptual understanding of the process it's involved. The list of activities and functions that make use of the computer grows each day. From registration procedures in schools and hospitals, to checkout counters in retail establishment, to banking transaction, sale in shops, malls and fuel stations the effects of these machines on our day-to-today lives are clearly of great magnitude and significance (Brynjolfsson & Hitt, 2000).

To appreciate the role of computer in information processing and management in any business organization, it suffices to outline what we understand by information in the ordinary sense as well a in the science sense. It will also be good if we consider the advantages and disadvantages of information dissemination.

Most of our fields permit the interchange of Data and information, except in management information specialization. Data is defined to be raw ideas or facts obtained from observations, research or recorded document (works, values, figures and so on) which represent things that have happened (Ackoff, 1989; Davis & Olson, 1985).

Information concept in an organizational sense is more complex and difficult than the different use of this common words, it is suggested that Information in the ordinary sense can be defined as a result obtained from processed data, while information in the science sense is regarded as knowledge contains in human brain that is use to make machines to imitate human being. It is observed that data which have been analyses, summarized and processed, in some order, in such a way that it produce message or report which is conventionally deemed to management of information becomes information only if it is understood by the recipient.

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Normally the users are responsible for the judgments whether report contains information or just process data. Accordingly, it is vital for the producers of all kinds to be aware of the user's requirements, education and position in the organization In general we defined information as knowledge and understanding that is useable by the recipient (Davis & Olson, 1985). If a message or report does not have these attributes as far as the recipient is concerned it contained mainly process data not information.

The value of information is normally derived from the value of the change in decision behavior coursed by the information minus the production cost of the information (DeLone & McLean, 1992; Davis & Olson, 1985). Information is said to be better report or message if it improves the resulting decision, otherwise it is said to have no value. Information that possesses the following feature is more likely to be a better information called relevant information:

1. Timely
2. Appropriateness
3. Accuracy
4. Details
5. Frequency
6. Understandability

Information Communication Technology (ICT) is normally considered in two terms namely; Information Communication and Information Technology and they both concerned the ways and means of how data is collected and processed to produce Information as well as how information is disseminated from sources to the destinations and the techniques and technologies involves in processing and dissemination of Information.

Application of Information Technology in Business

Information as we define earlier is the result obtain from processed data. The methods of collecting and processing data varies. In those day's we have only various manual methods, but with advancement in technology, modern methods of processing data were developed, as such information technology involved the various technologies used in production of information or the production of information that resulted from the modern technological methods of data processing.

Information Resource

Information is a critical resource of organizations, as fundamental as energy or machines it is the indispensable link that ties an organization component together for better operation and coordination and for survival in an unfriendly competitive environment (Laudon & Laudon, 2020). Indeed, today's companies run on information or highly depend on information management of their environments (Davenport & Prusak, 1998; Verhoef et al., 2021; Vial, 2019).

Qualitative Information

Information is data that have been put into a meaningful and useful context and communicated to a recipient who uses it to make decision. It involves he communication and reception of intelligence or knowledge. It also apprises and notifies, surprises and stimulates reduces uncertainty, reveals additional alternatives or help to eliminate irrelevant or poor ones, and influences individuals and stimulates them to action. Especially in business, information should give early warning signals and portend the future. Below is a simple schematic procedure that represent, how we will think of producing information and disseminating it.

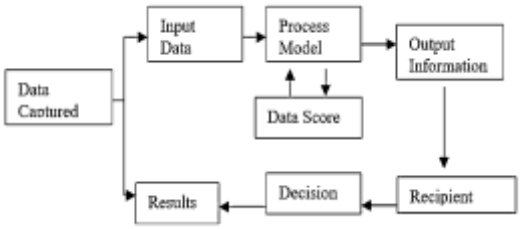


Fig 1. Data Processing

Need for Information Production

The need for producing information in every human endeavor in our daily activities is increasing every day. Investors in business need information about its financial status and its future prospects. Bankers and vendors need information to appraise the performance and financial

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soundness of a business before making loans or granting credit. It was observed that when you try o keep track of as many things as some people do, timely and accurate information is the essential resource to maintain organization needs its own types of information, so also, different departments, different levels of hierarchy requires different types o information to operate more efficiently.

Information System

An information system is a method of using reports to abstractly represent the actual events and conditions related to an organization (Laudon & Laudon, 2020; Rashid, 2013). An organization has certain physical and human resource inputs and in a processing system, these are used to generate, produce or service outputs for the market. The information systems report on certain occurrences in the organization.

It main purposes include;

1. Processing input
2. Maintaining data files
3. Outline procedure of information reports and other outputs.

Concept of Information Communication Technology

A modern organization requires information systems to support its managerial activities and decision-making functions. These systems of information are often called Management Information System or information processing system and are best produce through Information Communication Technology (ICT). ICT main purposes are;

1. Making the transaction systems to be operations oriented
2. Assisting managers in decision making and problem solving.
3. Draw on data store as a result of transaction processing, but they may also use other
4. information.

ICT characteristic includes:

1. Providing inputs to be used in the managerial decision processes
2. Deals with supporting well-structured decision situation process
3. Provide typical information requirements

Information and Control System;

The broad view of ICT encompasses four distinct types of information, supporting different type of users

1. Information regarding the routine processing of transactions.
2. Information necessary for day-to-day operations planning and decision making.
3. Information to aid tactical planning and decision making.
4. Information for support of strategic planning and decision making.

These levels are often regarded as a pyramid, as demonstrated earlier, with the bottom level providing information for the higher levels (Anthony, 1965; David, 2012; Gorry & Scott Morton, 1971), the fourth (strategic planning) represents the pinnacle for which all information is littered and summarized. Allied to each information layer or level is the association concept of information as the means to enable the organization to control its activities or to ensure that the organization does not deviate from the plans.

Definitions of ICT

There are many universally acceptable definitions of ICT. Let us look at two definitions.

1. **Information Communication Technology (ICT)** can be defined as an assemblage of technologies use to gather data (e.g. facts and opinions) that are processed (e.g. summarized reports, or projects) in such a way that they result in intelligent(e.g. information).that management can use to make decisions, and that the organization can use to attain goals and the means through which information is communicated.

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2. ICT can also be seen as a combination of human and computer-based resources that results in the collection, storage, retrieval, communication and use of data for the purpose of efficient management of operation and for business planning.

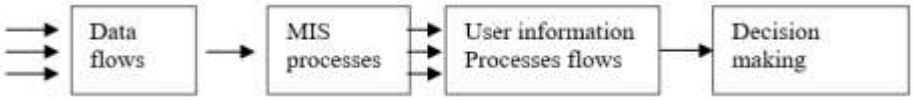


Fig. 2. Data processing and decision making

Decision Focus on ICT

This means that ICT are qualitatively different from data processing systems and that management involvement and interaction between information specialists and management is the key feature of successful ICT design (Davis & Olson, 1985; Hess et al., 2016). ICT can therefore be taken to be a system to convert data from internal and external sources in to information and to communicate that information in an appropriate form, to managers at all levels in all functions to enable them to make timely and effective decisions for planning, directing and controlling the activities for which they are responsible. Note the emphasis on the use of information in the definition not how it is produced.

Data Processing and Information System

Traditionally, computers have been used for basic data processing jobs, which directly affected the organizational operations and are largely and directly significant to management. Such applications include preparing payroll, cheques, and billing customers. Although these basic data processing applications are important, and although in many organizations they have been computerized, increasingly the focus is on applications that do have direct managerial implications.

Traditionally, management information has not received high priority. At best, it usually has represented relatively loose amalgamation of data and reports without any overall consistent pattern (Ackoff, 1967). Invariably, such information is generated only to fulfill basic accounting and legal requirements, and thus does little support management decision making.

Swing Interest in ICT

1. Today less time is available between the moment when a problem is presented to management, and the moment when a solution is needed. The complexity of organization, as well as the sheer volume and size of the problems, requires information systems that can facilitate sound and finely decision making.
2. Changed public attitudes towards organization and authority create need for information systems. The executive must be able to respond more sensitively to the inquiries and requests of serious active members of the public- for instance, government, consumer groups, stockholders, researchers, and investigators units.
3. Increasingly, organizations are staffed with sophisticated, better-educated people whose work is related to higher-technology processes (research and development, science-oriented organizations, automation and computer systems, and market research (Davenport & Ronanki, 2018; Drucker, 1988)). Executives must be able to provide leadership for such human resources, including assessing their activities and information.
4. Many organizations have gained experience with computers. And to some extend have established the basic processing elements that permit advancement towards ICT (Karakara & Osabuohien, 2020; Tob-Ogu et al., 2018).

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5. The computer hardware and software that are needed to handle ICT -level approaches are available now, in contrast with several years ago (Wamba et al., 2017).

The Importance of Information for Decision Making.

All managers perform the functions of planning organizing, controlling, and actuating with a view to using the organization resources in the best way possible (Mintzberg, 1973). The success of any organizations determined by how well its leader perform those activities And how well those functions are carried out is dependent, in part, on how well the managers' information need are being met. Each function involves decision making, and decision making must be supported by information that is accurate, timely, complete, concise, and relevant (as already mentioned) (Duan et al., 2019; Simon, 1960). If manager's information does not possess these characteristics, the quality of his decision will probably suffer, and the organization will not attain the success it might otherwise have had.

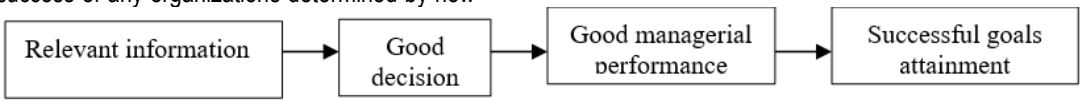


Figure 3: the importance of information to an organization

Figure 3 above suggest:

1. That quality information, in the hands of those who can effectively use it, will support good decision.
1. 2. That good actions will lead to effective performance of managerial functions; and
2. That effective managerial performance will lead to successful attainment of organizational goals.

The specific information required by a particular manager include:

1. Establish, evaluate and adjust goals;
2. Developed plans and standard to initiate action.
3. Measure actual performance and take appropriate action when performance varies from the plans and standards.
4. Assess achievements.

Related guidelines which can help in determining the information needed by a particular manager include:

1. Identification of those factors that determine the success of the manager's contribution to organizational goal
2. Determination of how these. critical factors can measured.
3. Establishments of quantifiable measurements that indicate success, for each critical factor.
4. Identification of the information need to ensure achievement of the success measurements. Each day, numerous management decisions may be required. Each decision process can be viewed as transformation of information into decision outputs.

Thus, the designer of an information system must concern him/herself with three aspects of the decision process;

1. The information inputs for the decision
2. The decision process
3. The Decision Outputs and How they result on action

An example of a management information report

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Table 1: A comparison of data processing and management information

ADA-Processing Report		Management Information Report				
ADA Corporation Expenses		ADA Corporation Budget/Expenses				
Dept	N	Dept	Budget (N)	Expenses (N)	(N) Variance	(%) Variance
A	10,000	A	8,000	10,000	(2,000)	(20)
B	15,000	B	16,000	15,000	1,000	6
C	1.100	C	1,000	1,100	100	(9)
Total	N26,100		N25,000	N26,100	(N3,100)	(35)

NOTE: Variance in brackets signifies unfavourable situations. The table above presents a simple example that compares data processing into with ICT.

The data-processing report is a straightforward, traditional listing of expenses by departments, with a total that indicates the expenses for the period. However, this report is of little value to a manager, who cannot judge what he figures mean unless she/he has other sources of information. Are the figures good indicators? Are they bad indicators?

In contrast, the management information report gives the manager rational and helpful information that can sharpen his/her analysis and decisions. The manager can quickly ascertain that, for the period, departments A and C have expenses in excess of their budgets. Also, it is apparent that department B is operating under budget. The manager can find out why department A has exceeded its cost objectives by N2,000, which is a substantial variance of (20%).

He/she might even want to find out how Department B is able to operate effectively with N1, 000 under budge for expenses. On the surface, this condition appears to be a favourable development, however, suppose that the saving is because, a critical position in the department cannot be filled. In that case, the "favourable" variance may actually hide an unfavourable condition. As the table shows, the management information report stimulates thinking and managerial action.

Computer-Base ICT

Recent technology has created the potential for significant improvements in ICT. Such potential has aroused considerable interest about computer-based ICT (Brynjolfsson & Hitt, 2000; Dwivedi et al., 2021; Mikalef et al., 2018).

Computer's features that make an **ICT** more feasible are;

1. Accurate and rapid processing of data:
2. Vast storage and prompt retrieval of information
3. Performance of computations and logical operations with very high reliability. Without the computer, sophisticated and even unsophisticated information systems would be difficult to attain in today's complex organization.

An effective information system should have certain characteristics that permit:

1. Selection of information that is relevant to particular situation (management by exception), thus preventing either on excess or scarcity of information.
2. Comparison of current information, with plans (feedback) to discover deviations and, if needed, trigger corrective action.
3. Immediate access to information to supper management decisions in unpredictable situation.
4. Delivery of information is a timely fashion to facilitate decision making.
5. Horizontal and vertical dissemination of needed information so that all affected persons will be informed properly.

Management Information Systems Concept

The data elements in the database can combined and manipulated to provide an combination of integrated information. The integrated information can be filtered on the basic of any set of rules, resulting in selected

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information. The levels of the ICT are planned so that they are responsive to the levels of responsibility in the organization.

System Concept

What is a system Approach?

The word "system" is widely used in contemporary vocabulary, to describe many things in difference fields- transportation system, telephone systems, paper work systems, weapons systems, computer systems, social systems, nervous systems, and sound systems. The only common characteristic is that each is composed of many different parts and in each case it is the sum of all the parts that are of interest. The concept of an orderly collection of a series of different parts implies other characteristics which are usually associated with a system.

These characteristics may be generalize as follows:

1. Coordinated components - A system is composed of a series of interrelated components or subsystems, or elements whose activities are coordinated according to some set of predetermined rules (von Bertalanffy, 1968).
2. Systems are usually hierarchical in that the parts or sub-systems are made up of the other smaller parts. For example, the accounting system of an organization may be a sub-system of the information system which is itself a sub-system of the planning system, which is sub-system of the organization.
3. The parts of a system constitute an indissoluble whole so that no part can be altered without effecting other parts. Many organizational problems stem from ignoring this principle. For example, a departmental; procedure or form might be changed without considering the ripple effects on the other departments affected with dire consequences.
4. The sub-systems should work towards the goal of their higher systems and not pursue their own objectives independently. Where sub-systems do their own objectives to the detriment of higher objectives, then a condition of sub-optimality is said to exist and in general MIS designers seek to avoid sub-optimality where possible.
5. Internal and external Environment- The system concept involves both an external and an internal environment. The internal environment is control and altered by the interaction of the system components; the external environments consist of forces that act on the system but which are the direct controls of the system itself (Katz & Kahn, 1978).
6. Information Flow -A system involves communications. The coordinated action of the various components, which controls the internal environment, is achieved by data flow connecting the components (Shannon & Weaver, 1949). The sensing of the external environment provides the stimuli for the action of the components.
7. Objective- A system has a purpose or objective. It is generally self-initiated, for a system achieve it goals by influencing the external environment or by modifying its relationship to the external environment.

Definition of a System

We will define a system as an assembly of parts or components where;

1. The parts or components are connected together in an organized way.
2. The parts or components are affected by being in the system and are change by leaving it.
3. The assembly does something and
4. The assembly has been identified by a person as being of special interest.

A typical manufacturing company or service organization can be viewed as a system

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whereby people, grouped into sections and departments, process inputs to produce outputs of good and/or service in order to fulfil the objectives of the organization.

System Elements

All systems are composed of three basic elements that is input, process and output. The fundamental relationship of these elements is as shown in figure 4



Fig. 4. Relationship of system elements

Input - Data concerning the external and internal environment must be transmitted, and classified. Events must be recorded in a form usable by the computer.

Processing -The raw data must be converted into a form meaningful to be system purpose. This may involve any number of data manipulation and logic operations. The conversion will follow some prescribed rules consistent with the objectives and purposes of the system.

Output - The results of the conversion must be transmitted to other system elements in a form they can recognize.

In an actual system these elements are combined in a variety of ways. They may be repeated, paralleled, and interrelated. Output from one set of elements may become input to another set. Fortunately, it is not usually necessary (or possible) to consider all possible inputs and outputs.

The usual procedure when analyzing systems is:

1. To choose those outputs with which we are concerned-these are usually those outputs that are relevant to the system objectives, and
2. To choose those inputs for examination and control which are considered to have significant effects on the outputs consider important. Figure 22 depicts this.

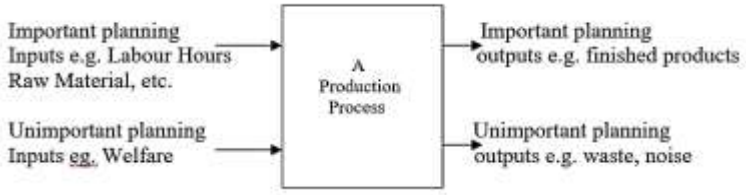


Figure 5: Production process-important and unimportant element.

In all systems other than physical or mechanical ones. The transformation process is controlled by information. In the simplest case, information on the output of the system is used as a basis for control of the input of the system. This is known as feedback or information feedback. We will look as this later.

System Boundaries

The features areas or constraints, which delineate systems are its boundaries. In mechanical, physical and biological systems the boundaries can usually be defined easily. When dealing with any form of social organization, boundaries are not easily defined and are often flexible with changes occurring over time or as adaptations to meet changing demands and activities. The area of contact between one system boundary and another is called the interface. Monitoring, regulating and deciding upon the interfaces and boundaries between the systems which make up the organization-usually called departments and sections-is a primary task of management. This is usually known as "ensuring integration", 'Co-ordinating activities" or 'aiding departmental cooperation'. In social organizations boundaries are permeable to a greater or lesser degree with many transfers

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across boundaries of ideas, money, people, materials and information. Other types of system have rigid impermeable boundaries, which do not permit transfers or cross boundary flows.

Within organization, boundaries are determined by management and vary from organization to organization even within the same industry. For example, in one organization the Sales Department may be responsible for invoicing whereas in another, invoicing may be within the boundary of the accounting system.

The Environments of Systems

In the widest sense, a system's environment is all those elements not in the system. However, this is a very broad notion and more appropriately for our purpose the environment can be defined as those external elements whose changes in attitudes, behavior or properties affect the state of the system and those external elements which are change by the system's behavior. In effect, this means that the relevant environment of any system comprises those elements with which it has some meaningful connection or relationship.

Directly or indirectly systems receive their inputs from the environment and the environment directly or indirectly receives their outputs provided that they system boundaries are permeable and permit cross boundary transfers. The concepts of boundaries and environments lead to the crucial distinction between closed systems and open systems described below.

Closed Systems

These are systems with rigid, non-permeable boundaries, which do not have exchanges with their environments. Closed systems are self-contained and the concept can strictly only be applied to mechanistic and physical systems. Overtime a close system tends to move towards greater disorder and randomness until there is no further potential for work of energy transformation. This disorder, randomness and lack of pattern of a system is known as its entropy. Although no organization or part of an organization can be a close system, for some purposes attempts are made to limit or prescribe, the exchanges with a system's environment in order to make the systems more controllable.

Open Systems

Biological and social systems, including the social organizations known as companies or firms are open systems. This means they have a dynamic relationship with their environment. They receive inputs from their environment, transform or deal with these inputs in some ways and pass outputs of various types back into the environment. It is the receipt of inputs in the form of materials, energy, ideas and information that enables the open system to offset the process of entropy. The ready adaptation to charges in an organization's environment is the key element in an organization's success and indeed its very survival. The identification of key elements in the environment which will affect the organization is a very prime task of management and the firm's MIS.

Disturbances and changes can come from variety of sources of which the following are examples:

1. Changes in social attitudes.
2. Changes in demand patterns.
3. The introduction of new materials. Technology, etc.
4. Government legislation,
5. Industrial relations and trade unions, etc.

Interactions and Adaptability

In addition to relations with the external environment, an open system has interactions between the components, which make up the systems. It is this 'internal' openness which enables systems to adapt to their environment by changing the structures and methods of operations of the internal elements. This is why dynamic and successful organizations periodically change their departmental structures and operating methods. They do this to ensure successful adaptations to changes in the environment. Conversely, a reluctant to change methods, structures, and products to meet the demands of an ever-changing environment will inevitably lead to decline (Melville et al., 2004).

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Figure 6 below gives a summary of open and closed systems.

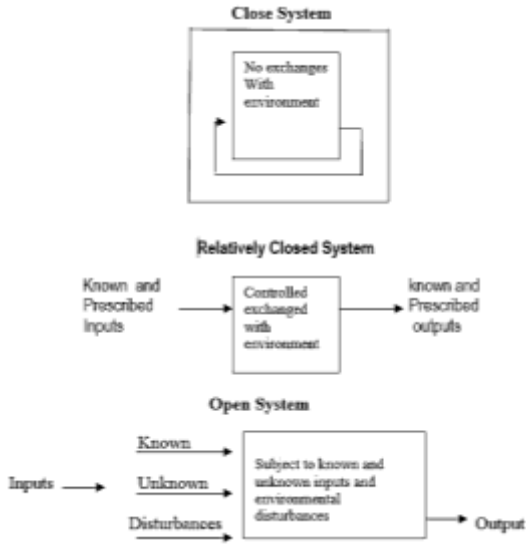


Fig. 6: Relationship with the environment

Boundaries and Interfaces

The study of the relationship that exist and the transfers that are made at the system environment boundaries are a major part of the systems approach. It is these relationship and transfers that are ignored in closed systems. Closed systems have as many virtues but have limitations where there are interdependencies between the subsystems which make up a system and between the system and its environment, that is in all living and social systems. In an organization this means that the relationships and transfers between departments must be studies as well as the internal operation of the departments themselves. As an example of the relationships which may exist within one system.

RECOMMENDATIONS

1. That all organizations should endeavour to develop an integrated ICT Department or Directorate
2. Dissemination of both data and information within organizations should be given priority.
3. Staff should be ICT oriented.

CONCLUSION

In order to achieve the above recommendations organizations should endeavour to purchase/acquire all tools, equipment and software and ICT staff should be given regular training on ICT and information processing techniques (Brynjolfsson & Hitt, 2000).

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