ICS 101

INFORMATION, COMMUNICATION SOCIETY

University of Ilorin
Centre for Open &
Distance Learning

CODL

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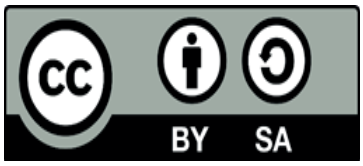


From the Vice Chancellor

Courseware development for instructional use by the Centre for Open and Distance Learning (CODL) has been achieved through the dedication of authors and the team involved in quality assurance based on the core values of the University of Ilorin. The availability, relevance and use of the courseware cannot be timelier than now that the whole world has to bring online education to the front burner. A necessary equipping for addressing some of the weaknesses of regular classroom teaching and learning has thus been achieved in this effort.

This basic course material is available in different electronic modes to ease access and use for the students. They are available on the University's website for download to students and others who have interest in learning from the contents. This is UNILORIN CODL's way of extending knowledge and promoting skills acquisition as open source to those who are interested. As expected, graduates of the University of Ilorin are equipped with requisite skills and competencies for excellence in life. That same expectation applies to all users of these learning materials.

Needless to say, that availability and delivery of the courseware to achieve expected CODL goals are of essence. Ultimate attention is paid to quality and excellence in these complementary processes of teaching and learning. Students are confident that they have the best available to them in every sense.

It is hoped that students will make the best use of these valuable course materials.

Professor S. A. Abdulkareem
Vice Chancellor

Foreword

Courseware remains the nerve centre of Open and Distance Learning. Whereas some institutions and tutors depend entirely on Open Educational Resources (OER), CODL at the University of Ilorin considers it necessary to develop its own materials. Rich as OERs are and widely as they are deployed for supporting online education, adding to them in content and quality by individuals and institutions guarantees progress. Doing it in-house as we have done at the University of Ilorin has brought the best out of the Course Development Team across Faculties in the University. Credit must be given to the team for prompt completion and delivery of assigned tasks in spite of their very busy schedules.

The development of the courseware is similar in many ways to the experience of a pregnant woman eagerly looking forward to the D-day when she will put to bed. It is customary that families waiting for the arrival of a new baby usually do so with high hopes. This is the apt description of the eagerness of the University of Ilorin in seeing that the centre for open and distance learning [CODL] takes off.

The Vice-Chancellor, Prof. Sulyman Age Abdulkareem, deserves every accolade for committing huge financial and material resources to the centre. This commitment, no doubt, boosted the efforts of the team. Careful attention to quality standards, ODL compliance and UNILORIN CODL House Style brought the best out from the course development team. Responses to quality assurance with respect to writing, subject matter content, language and instructional design by authors, reviewers, editors and designers, though painstaking, have yielded the course materials now made available primarily to CODL students as open resources.

Aiming at a parity of standards and esteem with regular university programmes is usually an expectation from students on open and distance education programmes. The reason being that stakeholders hold the view that graduates of face-to-face teaching and learning are superior to those exposed to online education. CODL has the dual-mode mandate. This implies a combination of face-to-face with open and distance education. It is in the light of this that our centre has developed its courseware to combine the strength of both modes to bring out the best from the students. CODL students, other categories of students of the University of Ilorin and similar institutions will find the courseware to be their most dependable companion for the acquisition of knowledge, skills and competences in their respective courses and programmes.

Activities, assessments, assignments, exercises, reports, discussions and projects amongst others at various points in the courseware are targeted at achieving the objectives of teaching and learning. The courseware is interactive and directly points the attention of students and users to key issues helpful to their particular learning. Students' understanding has been viewed as a necessary ingredient at every point. Each course has also been broken into modules and their component units in sequential order.

At this juncture, I must commend past directors of this great centre for their painstaking efforts at ensuring that it sees the light of the day. Prof. M. O. Yusuf, Prof. A. A. Fajonyomi and Prof. H. O. Owolabi shall always be remembered for doing their best during their respective tenures. May God continually be pleased with them, Aameen.

Bashiru, A. Omipidan
Director, CODL

Course Guide

The focus of ICS 101 (Information, Communication & Society) is on how information is communicated within the society. It consists of five modules and fourteen units. The first module examines the concepts of data, information and knowledge and the types of data and information. The next module looks at information and its value and the quantitative ways of measuring the value of information. Module three concentrates on information systems, types and processing while module four is about the channels of communication. The last module focuses on new technologies and on the interaction of individuals in various information related environments and the social, economic and cultural impact of the features of the new information and communication technologies.

Course Goal

The overall goal of this course is to provide a foundation course that will produce information and communication specialists who are well grounded in the theory and practice of information management, information systems deployment, information communication, and information/data distribution.

Prerequisite: Nil/List pre-requisite course(s)

Registered students for this course will be provided with login details at the point of registration. Download and read through the unit of instruction stated for each week before scheduled time of interaction with the course tutor/ facilitator.

You can also download and watch the relevant video and listen to the podcast so that you will understand and follow the course facilitator.

At scheduled time, you are expected to login to the classroom for interaction.

Self-assessment component of the courseware are available as exercises to help you learn and master the content you have gone through.

You are to answer the Tutor Marked Assessment (TMA) for each unit and submit for your assessment.

Throughout your interaction with this course material, you will notice some set of icons used for easier navigation of this course materials. We advise that you familiarize yourself with each of these icons as they will help you in no small ways in achieving success and easy completion of this course. Find in the table below, the complete icon set and their meaning.

WORK PLAN

Learning Outcome

- Distinguish between data and information.
- Explain the meaning of knowledge.

Course Guide

MODULE 1

DATA EXAMINATION

SUB UNITS

Unit 1 Definition of Data, Information and Knowledge

Unit 2 Types of Data and Information.

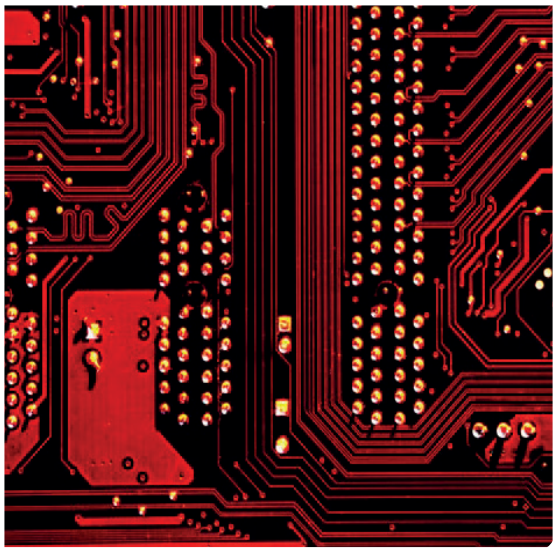
MODULE 2

INFORMATION AND ITS VALUE

SUB UNITS

Unit 1 The Value of Information

Unit 2 Quantitative Ways of Measuring the Value of Information



Pre-requisite

ICS 101

There are no pre-requisite cources

Describe the relationship between data, information and knowledge

MODULE 3

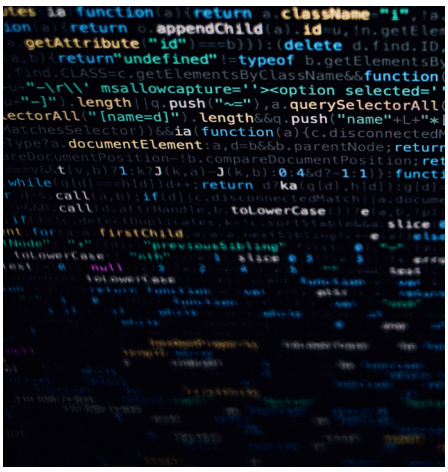
INFORMATION SYSTEMS: TYPE AND PROCESSING

SUB UNITS

Unit 1 Meaning and Types of information systems

Unit 2 Information Systems development and methodology

Unit 3 Information Systems Research and information



MODULE 4

CHANNELS OF COMMUNICATION

SUB UNITS

Unit 1 Meaning and Process of Communication

Unit 2 Types of Communication Channels

Unit 3 Barriers and breakdowns in communications.

MODULE 5

NEW TECHNOLOGIES AND ITS IMPACT

SUB UNITS

Unit 1 Overview of the various technologies

Unit 2 Uses and Benefits of Information and Communication Technologies

Unit 3 Socio-economic, cultural, religious and environmental impact of ICTs

Unit 4 Future trends of Information and Communication Technologies Embedded Support Devices

Requirements for success

The CODL Programme is designed for learners who are absent from the lecturer in time and space. Therefore, you should refer to your Student Handbook, available on the website and in hard copy form, to get information on the procedure of distance/e-learning. You can contact the CODL helpdesk which is available 24/7 for every of your enquiry.

Visit CODL virtual classroom on http://codllms.unilorin.edu.ng. Then, log in with your credentials and click on **ICS 101**. Download and read through the unit of instruction for each week before the scheduled time of interaction with the course tutor/facilitator. You should also download and watch the relevant video and listen to the podcast so that you will understand and follow the course facilitator.

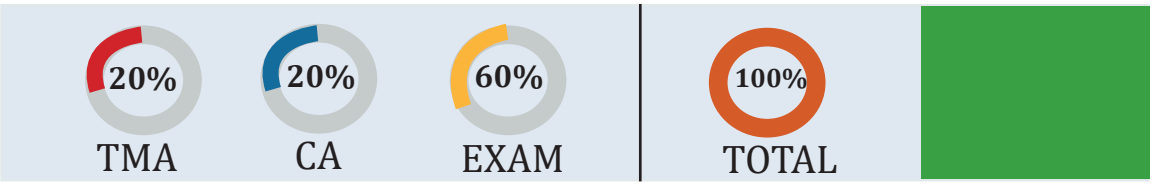
At the scheduled time, you are expected to log in to the classroom for interaction.

Self-assessment component of the courseware is available as exercises to help you learn and master the content you have gone through.

You are to answer the Tutor Marked Assignment (TMA) for each unit and submit for assessment.

Assignments and Grading

Weight will be given to assignments and final examination as follows:

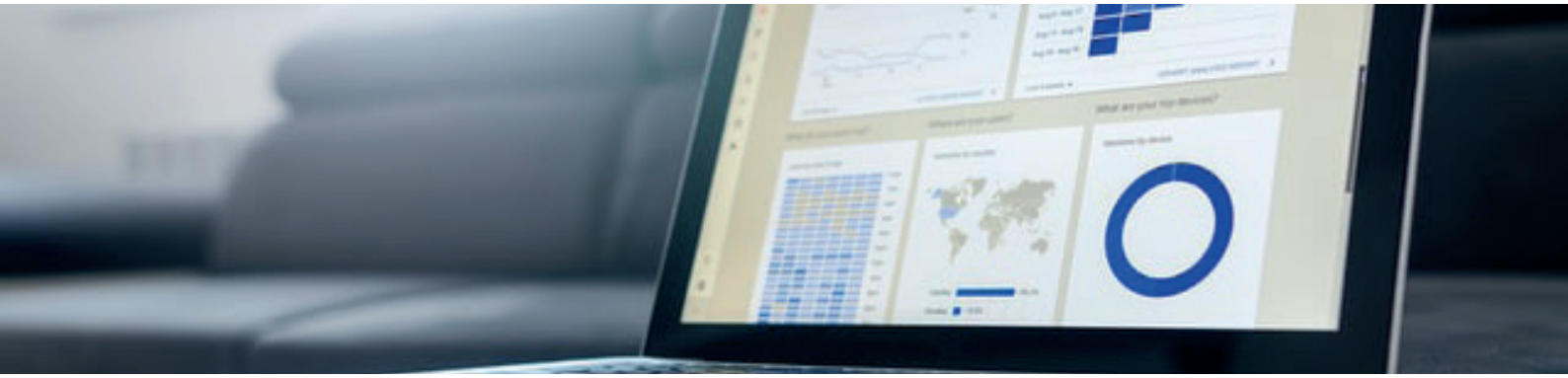


Data analysis
source: Stephen Winkler by unsplash

Module 1

DATA EXAMINATION

Units



Information data
source: Unsplash (lukaz blakez)

Unit 1

Definition of Data, Information and Knowledge

Introduction

I welcome you to this unit, I will explain to you Data, information and knowledge, how they have been distinguished with a simplistic view which considers knowledge as being at the highest level in a hierarchy with information at the middle level and data at the lowest level..

Learning Outcomes

The objective of this unit is to introduce this course and discuss the concept of data, information and knowledge, and the relationship between the three concepts. When you have studied this unit, you should be able to:

- Distinguish between data and information.
- Explain the meaning of knowledge.
- Describe the relationship between information and knowledge

Multiple Laptop on a table
Source: Unsplash (Marvin Meyer)

Main Content

DEFINITION OF DATA, INFORMATION AND KNOWLEDGE

Definition of Data [SAQ1]

Reading time: 1 Min

You should be aware that data is a collection of facts, figures and symbols such as values or measurement. You should note as well that it can be in form of numbers, words, measurement, observations or even just description of things. Data can be collected through interviews, direct observation or surveys. A set of data may or may not be meaningful depending on the usefulness to the user.

Data are what an individual can perceive with any of the five senses, and from which information can be generated. Data can be communicated by other people, documents, computer or telecommunication systems (internet). Example of data is the list containing the jamb scores of students.

Data and information are two closely interrelated concepts that people unconsciously use interchangeably; but in the actual sense they are different from each other. Tamiyu (2003) defined data as communication symbols that are used to describe an entity. Communication symbols become data when they are used to express an idea or describe a particular entity. This means that data can be written, spoken or implied by non-verbal actions. For instance the symbols “large” and “small” can be used to describe the size of ICS 101 class. In this instance, the symbols are the data being used to describe the size of the class.

Meaning of Information [SAQ1]

Reading time: 1 Min

I should inform you that information is meaningful data in the sense that it has to be processed, translated, summarized, and arranged by the user of the information. Tiamiyu (2003) defined information from three main perspectives:

- Sender's definition of information
- Receiver's definition of information

The sender definition of information is the understanding or meaning intended by the sender of the data. The receiver's definition of information is the understanding or meaning derived or inferred by the recipient of the data. In the process of communicating information, for instance, Mr. (X) might want to communicate an expression "short man" to Mr. (Y) with a symbol. This type of information might be perceived accurately or differently depending on some factors:

- The ability of the sender to accurately perceive the entity/data/ symbol.
- Appropriateness of the data to describe the particular entity.
- Ability of the recipient to infer accurately from the data intended.

The difference between information intended and information inferred is referred to as "Noise". Noise tends to distort the information conveyed or inferred thereby reducing the effectiveness of communication.

The average definition of information is the average of the different meaning that senders and recipients in a particular community infer from a given set of data. For instance three individuals in a community might interpret the data "short man" differently depending on their level of perception. However, the average interpretation of the data "short man" would be taken as the information conveyed by the data in that community.

Misinformation is false or inaccurate information that is spread unintentionally, which can be misleading. Misinformation arises when there is not enough evidence, facts or figures concerning a particular situation, therefore, leading to generalization. E.g. ICS 101 lecturer will not be coming for classes till next week.

Disinformation on the other hand is deliberately giving false information that is meant to mislead either

Meaning of Knowledge [SAQ2]

Reading time: 1 Min

Knowledge is the appropriate collection of information, such that it's intent is to be useful. Knowledge is a deterministic process. When someone "memorizes" information (as less-aspiring test-bound students often do), then they have amassed knowledge. This knowledge has useful meaning to them, but it does not provide for, in and of itself, an integration such as would infer further knowledge. For example, elementary school children memorize, or amass knowledge of, the "times table". They can tell you that "2 x 2 = 4" because they have amassed that knowledge (it being included in the times table). But when asked what is "1267 x 300", they cannot respond correctly because that entry is not in their times table. To correctly answer such a question requires a true cognitive and analytical ability that is only encompassed in the next level... understanding. In computer parlance, most of the applications we use (modeling, simulation, etc.) exercise some type of stored knowledge.

In other words, knowledge is a subset of information. It is a subset that has been extracted, filtered, formatted in a special way. More specifically, the information we call knowledge is information that had been subjected to, and passed test of validation. For instance scientific knowledge (hypotheses and theories) validated by the rules and test applied by the scientific community. Knowledge acquisition therefore, involves complex cognitive processes: perception, learning, communication, association and reasoning. Table 1.1.1

Data	Information	Knowledge	Source
Data is comprised of the basic, unrefined, and generally unfiltered information	Information... is much more refined data... that has evolved to the point of being useful for some form of analysis	Knowledge resides in the user...happens only when human experience and insight is applied to data and information	Knowledge Nirvana – Achieving The Competitive Advantage Through Enterprise Content Management and Optimizing Team Collaboration; by Juris Kelley, 2002, Xulon Press

Data	Information	Knowledge	Source
	Information has been defined data that is " in –formation" that is data that has been stored, analyzed, displayed and is communicated through spoken languages, graphics displas or numeric tables.	Knowledge… is defined as the meaninful link people make in their minds etween information and its application in action in a specific setting.	Common Knowledge– How Companies Thrive by Sharing What They Know; by Nancy M. Dixon, 2000, Harvard BusinessSchool Press.
		Davenport and Prusak have come up with this definition of knowledge: it is a mixture of organized experiences, values, information and insights offering a framework to evaluate new experiences and information	An Intelligent Organization – Integrating Performance, Competence and Knowledge Management; by Pentti Sydanmaanlakka, 2002, Capstone Publishing
	Information: Processed data… formalized, capture and explicated; can easily be packaged into reusable form	Knowledge: Actionable information… often emerges in minds of people through their experiences	The Essential Guide to Knowledge Management – E - Business and CRM Applications; by Amrit Tiwana, 2001, Prentice – Hall
	Information is data put in context; it is related to other pieces of data. Information is about	Knowledge… encompasses the belief s of groups or individuals, and it is intimately tied	Enabling Knowledge Creation – How to Unlock the Mystery of Tacit Knowledge and Release the Power of Innovation; by Georg Von Krogh, Ichijo, and Nonaka,

Data	Information	Knowledge	Source
	meaning, and it forms the basis for knowledge	to action.	2000, Oxford University Press
	Information has been defined as data that is " in formation" – that is, data that has been stored, analyzed, and displayed, and is communicated through spoken language, graphic displays, or numeric tables.	Knowledge... is defined as the meaningful links people make in their minds between information and its application in action in a specific setting.	Common Knowledge – How Companies Thrive by Sharing What They Know; by Nancy M. Dixon, 2000, Harvard Business School Press
Data are elements of analysis.	Information is data with context.	Knowledge is information with meaning.	Managing Knowledge Workers – New Skills and Attitudes to Unlock the Intellectual Capital in Your Organization; by Frances Horibe, 1999, John Wiley & Sons. Innovation Strategy for the Knowledge Economy: The Ken Awakening; by Debra M. Amidon, 1997, Butterworth-Heinemann.
Data must be organized to become information.	Information must be put into context to become knowledge.		The Art of Being Well Informed – What You Need To Know To Gain The Winning Edge In Business; by Andrew P. Garvin, 1996, Avery Publishing Group.
	Information is a flow of messages.	Knowledge is created by the very flow of information, anchored in	The Knowledge - Creating Company – How Japanese Companies create the Dynamics of Innovation, by Ikujiro Non

Data	Information	Knowledge	Source
		the beliefs and commitment of its holder."	aka and Hirotaka Takeuchi, 1995, Oxford University Press.
Data is a set of discrete, objective facts about events… as structured records of transactions.	Information… as message… in the (various) form of communication… to have an impact on judgment and behavior.	Knowledge is a fluid mix of framed experience, values, contextual information, and expert insights that provides a framework for evaluating and incorporating new experiences and information…	Working Knowledge: How Organizations Manage What They Know. By Thomas H. Davenport and Laurence Prusak, 2000. Harvard Business School Press.
Data: 1. factual information used as a basis for reasoning, discussion, or calculation; 2. information output by a sensing device or organ that includes both useful and irrelevant or redundant information and must be processed to be meaningful; 3. information in numerical form that can be digitally transmitted or processed.	Information: 1. the communication or reception of knowledge or intelligence; 2. knowledge obtained from investigation, study, or instruction; 3.	Knowledge: 1. Cognizance; 2. the fact or condition of knowing something with familiarity gained through experience or association; 3. the range of one's information or understanding; 4. the sum of what is known: the body of truth, information, and principles acquired by mankind.	Merriam Webster's Collegiate Dictionary 10th ed.

Relationship between data, information and knowledge [SAQ3]

Reading time: 1 Min

Knowledge has been distinguished from data and information in the following way (Becerra-Fernandez and Sabherwal, 2010). A simplistic view considers knowledge as being at the highest level in a hierarchy with information at the middle level and data at the lowest level. According to this view, knowledge refers to information that enables action and decisions or information with direction. Hence, knowledge is intrinsically similar to information and data, although it is the richest and deepest of the three, and is consequently also the most valuable. Based on this view, data refer to bare facts void of context, for example a telephone number.

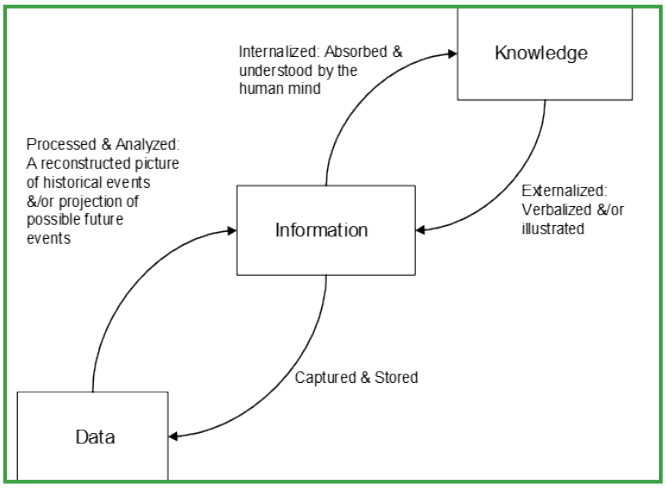


Fig. 1.1.1: Relationships amongst Knowledge, Information, and Data (Source: Liew, 2007)

Information is data in context, for example a phone book. Knowledge is information that facilitates action, for example, individuals who are the domain experts within an organization. An example of knowledge includes recognizing that a phone number belongs to a good client who needs to be called once per week to get his orders. Thus, knowledge helps produce information from data or more valuable information from less valuable information.

Another way we can demonstrate the relationship between data, information and knowledge is that data represents a fact or statement of event without relation to other things, example: it is raining. Information embodies the understanding of a relationship of some sort, possibly cause and effect, example: the temperature dropped 15 degrees and then it started raining. While knowledge represents a pattern that connects and generally provides a high level of predictability as to what is described or what will happen next, example: if the humidity is very high and the temperature drops substantially the atmospheres is often unlikely to be able to hold the moisture so it rains.

Summary

In this unit, we have explained the nature of data, information and knowledge in considerable detail and we have also highlighted the relationship between the three concepts. Data is a "raw material" - it needs to be processed before it can be turned into something useful. Information is data that has been processed in such a way as to be meaningful to the person who receives it, while knowledge is the appropriate collection of information, such that its intent is to be useful. The relationship between the three is that data refer to bare facts void of context, for example a telephone number, information is data in context, for example a phone book, while knowledge is information that facilitates action for example recognizing that a phone number belongs to a good client who needs to be called once per week to get his orders.

Self-Assessment Questions

1. Differentiate between data and informa tion?
2. Explain what you understand by 'knowledge'.
3. Describe with appropriate examples, the relationship between data, information and knowledge.

TUTOR MARKED ASSIGNMENT

1. What is data?
2. Define the term information.
3. How can you explain the concept of knowledge?
4. The _____ definition of information is the understanding or meaning derived or inferred by the recipient of the data.
5. In not less than 200 words, distinguish between data, information and knowledge.

6. With the aid of a diagram, describe the relationship between, data, information and knowledge.
7. Explain the term “Misinformation”.
8. Compare and contrast three different definitions of data and information.

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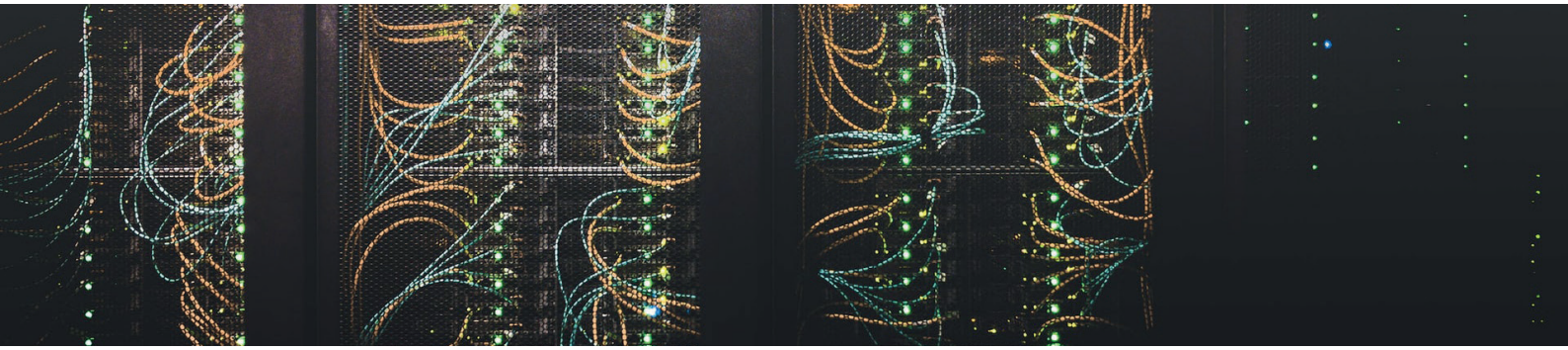
Liew, W. (2007). Understanding Data, Information, Knowledge and their Inter-Relationships. Journal of Knowledge Management Practice, 7(2), pp 6-7.

Becerra-Fernandez, I. and Sabherwal, R. (2010). Knowledge Management System and Processes. M.E. Sharpe, Inc, New York

Further Reading

Tiamiyu, M. A. (2003). Organization of Data in Information Systems: A synthesis for the Information Professions. Ibadan: Stirling Horden Publishers, 247p.



Network cable
source: Unsplash (Taylor Vick)

Unit 2

Types of Data and Information

Introduction

In this unit I will explain how Data and information are classified based on usage, mode of transmission, technicality, etc. I will shed more light on this classification.

Learning Outcomes

At the end of this unit, you should be able to:

At the end of this unit, you should be able to:

- Explain the different types of data based on usage
- Differentiate between primary and secondary data
- Give main idea between textual, numeric and pictorial data
- Compare and contrast qualitative and quantitative data
- Explain the three main sources of information

Ropes on lines
source: Unsplash (Bernard hermant)

Main Content

Types of Data and Information [SAQ1-5]

Reading time: 4 Min

Types of Data

We can classify Data based on its usage to the user. These are divided into two types:

• **Primary data**- This is data observed or collected directly by firsthand experience by the researcher using methods such as interviews and questionnaire. The key point here is that the data you collect is unique to you and your research and until you publish no one has access to it.

• **Secondary data**- This is data that had been collected and collated by somebody other than the researcher for some reasons not related to the current study. It can be used to get different perspectives on the current study, to supplement or compare the work with others. It is data that is neither collected directly by the user nor specifically for the user. It may be available from internal sources or collected and published by another organization. Examples of secondary data include: published reports, Government Statistics, Scientific and technical reports, financial statements, Bank's reports, Books, Magazine, Websites, Television, Radio, Newspaper, Films, Journals and Publications. These sources are in exhaustible.

Advantages of secondary information include it is cheap and inexpensive, it is easily accessible, it is readily available, it saves time and effort, it provides a basis for compar ison. The disadvantages include credibility of the source of publication or report cannot be ascertained, the data might be outdated i.e. it may not be relevant to your scope of study, the researcher has no control over the quality of the data collected, authenticity of the data collection measures might be questionable.

Data can further be divided into three main types

- Textual data e.g The boy has small stature
- Numerical data e.g 45.2 %
- Pictorial data e.g bar chart, histograms, tables etc

You should note, that data can also be qualitative or quantitative. Qualitative data includes virtually any information that can be captured that is not numerical in nature. It is descriptive information. It describes something. Qualitative data can be collected via:

- *Indepth interviews*
- *Direct observation*
- *Written documents*

The below data describes a little girl.

- *She is beautiful*
- *She is fair complexioned*
- *She has a long hair*

We use Quantitative data is used to describe a type of data that can be counted or expressed numerically. This type of data is often collected in experiments, manipulated and statistically analyzed. It can be represented virtually in graphs, histograms, tables and charts. Examples:

- The total number of students attending ICS 101 is 750
- The footballers' heights are expected to be 6ft 5inches each to participate in the match.

Table 1.2.1: Differences between Qualitative and Quantitative

Qualitative Data	Quantitative Data
Deals with description	Deals with numbers
Data can be observed but not measured	Data can be measured
Data can be expressed in colours, textures, appearance etc.	Data can be expressed in length, height, area, volume, weight, speed time, temperature, humidity, sound levels, cost ages etc.

Qualitative Data	Quantitative Data
Qualitative- Quality	Quantitative- Quantity

For your computer systems, there are two general ways to represent data: analog and digital. Analog data are continuous - it is 'analogous' to the actual facts it represents. Digital data are discrete and broken up into a limited number of elements. Nature is analog, while computers are digital. Many aspects of our natural world are continuous in nature. For example, think of the spectrum of colors. This is a continuous rainbow of an infinite number of shades. Computer systems, on the other hand, are not continuous but finite. All data is stored in binary digits, and there is a limit to how much data we can represent. For example, a color image on a computer has a limited number of colors - the number might be very large, but it is still finite.
Computer systems work with different types of digital data. In the early days of computing, data consisted primarily of text and numbers; however, in modern day computing, there are lots of different multimedia data types, such as audio, images, graphics and video. But, ultimately, all data types are stored as binary digits. For each data type, there are very specific techniques to convert between the binary language of computers and how we interpret data using our senses, such as sight and sound.

Data cannot be talked about without mentioning a database. A database is an organized collection of data. Instead of having all of the data in a list with a random order, a database provides a structure to organize the data. One of the most common data structures is a database table. A table consists of rows and columns. Each row is typically called a record, while each column is typically called a field. Table 1.1.2 is an example of a simple database table:

Table 1.2.2: Simple Student Course Registration Table

STUDENT_ID	FIRST_NAME	LAST_NAME	EXAM_ID	EXAM SCORE
12/42AA001	Praise	Musa	001	90
12/42AA001	Praise	Musa	002	85
12/42AA015	Ayobami	King	001	78
12/42AA015	Ayobami	King	002	72
12/42AA032	Yetunde	Owolabi	001	95
12/42AA032	Yetunde	Owolabi	002	92
12/42AA044	Haleemah	Ali	002	85

Types of Information

Based on mode of transmission of information:

Oral - verbal (One to one relationship) e.g. lecturing

Written - textbooks, magazine, newspaper

Gestures - signals, spoken or non-verbal cues

Organizational information

-Strategic level information (Top management)

-Tactical level information (Middle level managers)

Operational level information (Bottom level managers)

Form of Storage

-Numeric (conveying information using numbers) e.g. weather forecast, exchange rate, census exercise etc)

-Textual (conveying information using natural language) e.g. It will rain tomorrow.

-Image (Inferring information from an image) e.g. sign language, signatures, tribal marks etc.

Sound/Audio e.g. national anthem, whistle, siren, alarm (fire or clock).

Hard versus soft information- There is a thin line of difference between soft and hard information. What is hard today may be soft tomorrow. It is situation dependent. Hard information: This type of information is technical in nature. It cannot be easily comprehended by a layman that is not in a particular field. E.g. research reports, journals, feasibility
studies etc.

Soft information: This type of information can easily be comprehended by the users. It is not technical in nature. E.g. newspaper, magazines, textbooks etc.

If you observe, A source is the origin of something. It can be defined as a place, person or thing from which something can be obtained. In other words, an information source can be anything that conveys information or knowledge to somebody. Examples of information sources include: people, documents, pictures, organizations, computer systems, information systems, information centers, online databases, internet etc.

Sources of Information

Below are characteristics of information sources based on the information available in them:

A. Factual or Analytical

Factual information is a statement that can be proved, for example 1 + 1 = 2. It is also information that will always remain the same no matter where you look it up. Examples: Reference sources (print or electronic) such as dictionaries, almanacs, atlases, directories. Analytical information is an interpretation of factual information. It includes interpretations or analyses of facts, often made by experts. Examples: Books, articles and web pages.

B. Objective or Subjective

Objective information consists of non- judgmental or balanced reporting that presents all sides of a topic, including basic facts. Examples: Encyclopedias or handbooks. Can be in books, articles or web pages but the source must be carefully evaluated first. Subjective information means that only one point of view is represented. It expresses opinions or judgments based on individual personal impressions on a topic rather than external facts. Examples: Books published on basis of individual author(s)

experience, research results of viewpoints.

C. Primary sources or Secondary sources or Tertiary sources

Primary sources provide firsthand information or direct evidence concerning a topic under investigation. They are created by the witness or recorder who experienced the event or conditions being documented. Primary sources are original materials on which other research is based. These sources may appear in physical print or electronic format. They report a discovery, present original thinking or share new information. Examples include: artifacts (e.g. coins, plants specimen, furniture, tools, clothing); audio recordings (radio programs); dairies, websites survey research, market survey, public opinion polls; internet communication; newspaper articles; patents; proceedings of meeting; records of organization, government agencies, annual report, treaty, constitution etc

Secondary sources are less easily defined than primary sources. They are interpretation and evaluation of primary sources. Secondary sources are not evidence, but rather commentary on discussion of evidence. The definition of a secondary source may vary depending on the discipline or area of interest. Examples include: bibliographies, commentaries,dictionaries, encyclopedias, histories, journal articles, magazines and newspaper, textbooks, websites etc.

Tertiary sources consist of information which is a distillation and collection of primary and secondary sources. Examples include: almanacs, bibliographies (considered secondary), chronologies, dictionaries and Encyclopedia (considered secondary), directories, indexes, abstracts (they are used to locate prim

Print Sources vs. World Wide Web

Another way we will be looking at information source is the format, i.e. print and electronic sources. Information in all its forms, i.e., documents, books, newsletters, mails, databases, reports, images and many more, is a valuable resource in all societies and comes in both print and electronic forms. There are too many sources of information and not all information is reliable or true, hence the need to evaluate information sources. For print sources, quality standards is controlled through a system of checks and balances imposed by peer review, editors, publishers, and

librarians, all of whom manage and control access to printed information. This assures that published materials have been through some form of critical review and evaluation, preventing informal, poorly designed, difficult-to-use and otherwise problematic materials from getting into the hands of users. In academic and other research libraries, most books and periodicals are a product of the scholarly communication system. This system ensures that authors present information in an orderly and logical manner appropriate to the topic. Printed information in books and periodicals follows established linear formats for logical and effective organization. Materials in printed form are stable. Once in print, information remains fixed for all time. New editions and revisions often are published, but these are separate and distinct physical entities that can be placed side by side with the originals.

For electronic sources, anyone can with no supervision or review at all, put up a web page. On the Web, there is no systematic monitoring of much of what appears, except, of course, for articles published in the online forms of otherwise reputable scholarly journals and books. Biases, hidden agendas, distorted perspectives, commercial promotions, inaccuracies, and so on are not monitored. There is no standard format for web sites and documents. Web pages exhibit fewer clues regarding their origins and authoritativeness than print sources. Important information, such as dates, author(s), and references are not always easy to locate. While a reader can easily note this information in a book or periodical article, the web user must often search through several pages, if the information is provided at all. Internet sources are also not stable as web documents can be changed easily. And once changed, the original is gone forever unless a specific effort is made to preserve it. Web resources use hypertext links and need not be organized in any linear fashion.

One can easily be led astray and distracted from the topic at hand or led to additional information of value. Dead or broken and links on the Web are common and others just disappear or are not updated. For print sources, quality control is sought through critical evaluation during the publication process. However, on the web, anyone with access to the Internet can publish. Web pages are easy to create with little or no training. And there is no overriding organization or governing body ensuring the validity of web page content. There is a good deal of high-quality information on the web, but there is also much that is of questionable quality. It is the user's responsibility

to evaluate information sources, in print and on the web that they find during the research process before using it for academic purposes.

Summary

In this lesson, we have been able to outline the main types of data and information. Data can be classified based on its usage to the user: primary data and secondary data. Data can further be divided into three main types: textual data, numerical data and pictorial data. Data can also be qualitative or quantitative. For computer systems, there are two general ways to represent data: analog and digital. Information can be classified based on mode of transmission: oral, written, gestures. Organizational information is divided into strategic level information, tactical level information and operational level information. Information is also classified based on form of storage: numeric, textual, image, sound/audio. Information can also be hard or soft. Characteristics of information sources based on the information available in them are factual or analytical, objective or subjective and primary, secondary or tertiary sources. Another way of looking at information source is the format, i.e. print and electronic sources.

Self-Assessment Questions

1. Explain the different types of data based on usage.
2. Distinguish between primary and secondary data.
3. What is the difference between textual, numeric and pictorial data?
4. Compare and contrast qualitative and quantitative data.
5. State three main sources of information.

Tutor Marked Assignment

1. _____ is an example of pictorial data.
2. Quantitative data can be expressed in _____, _____, _____ and _____
3. Two advantages of secondary data are _____ and _____.
4. _____ and _____ are two examples of primary sources of information.
5. How can qualitative data be collected?
6. What is the difference between print and electronic sources of information?
7. Give two examples each of verbal and written information.
8. Explain the difference between hard and soft information.
9. Mention three forms of storing information.
10. Analyze the reasons why print sources are considered more credible than electronic sources.
11. Differentiate between objective and subjective sources of information.

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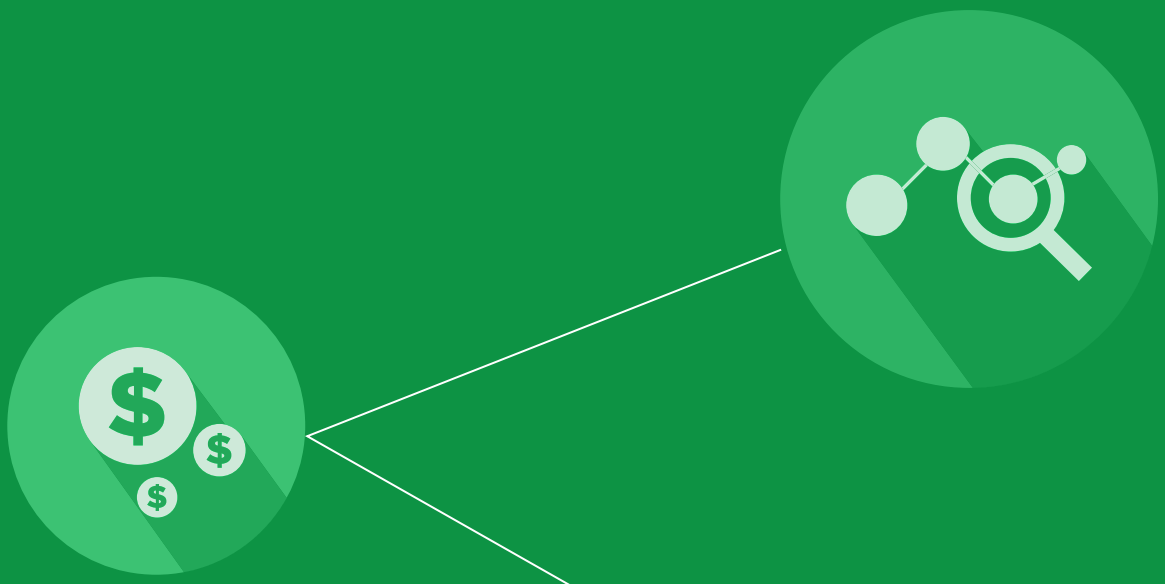
Information data
Source: Unsplash (Markus Spiske)

MODULE 2

INFORMATION AND ITS VALUE



Units

program codes
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Unit 1

THE VALUE OF INFORMATION

Introduction

In this unit I will put you through how the value of information lies solely in its ability to affect a behavior, decision, or outcome. A piece of information is considered valueless if, after receiving it, things remain unchanged. This unit describes the value of information to individuals and business organizations, the different methods used to determine the value of information and the characteristics of valuable information.

Learning Outcomes

At the end of this unit, you should be able to:

- Explain the value of information
- Differentiate information categories and what they are worth
- List and explain the characteristics of valuable information.

flash drive
Source: Unsplash (Marcus Winkler)

Main Content

THE VALUE OF INFORMATION

Does Information have Value ? [SAQ1&2]

Reading time: 5 Min

You will observe that information does have value; studies have proven it and experts can agree on it. The difficulty is then how to evaluate the value. There is actually no unit of measurement of information. The value of information depends on its usefulness to the user. Therefore, it is a function of its uses. Information is pre-requisite for decision making; it is inevitable in all sectors and crucial for the economic, social and political development of the modern society. Authors have agreed that information is data of value in planning, decision making and in the execution of organizational functions and management programs. The effectiveness of a decision maker is dependent not only upon his innate professional skill, judgment etc but also upon the completeness, quality, accuracy and timeliness of information upon which he bases his decisions.

Kelly (1993), stated that value is created as a result of utilising the information (or intelligence). Information is used for decision making, which means that the usability, usefulness or utilization of an information product is an important benchmark for its value. According to Frøkjær et al. (2010), usability consists of three independent aspects, namely: effectiveness, efficiency, and satisfaction. Effectiveness and efficiency can be measured quantitatively and can be related to financial value for the organisation. For satisfaction, it is more complex because it is not tangible. When the satisfaction is low for instance, it is not clear what the reason behind this is.

To find out the reason, satisfaction should be divided into sub-criteria. Another difficulty is that satisfaction is qualitative and subjective.

Information usability: Effectiveness

Effectiveness is about the actual effect the users can achieve by using the information product for a decision. If the decision resulted into business value because of the information, then the information is effective. To identify if a decision resulted into value, it is required to monitor finances or other business goals (using other information products). Extra income can be measured for instance by evaluating the extra sold services or products. A company can also evaluate the costs that can be saved when using information products saved costs.

Information usability: Efficiency

Information efficiency is mainly about saving time and effort. This is quantifiable by measuring the involved system activities.

Information usability: Freedom from Risk

Since ISO 25010 (2011), freedom from risk has been introduced as a characteristic of usability. The changed definition of usability means that freedom from risk is not been commonly used in usability research. Freedom from risk is the degree to which the information product "mitigates the potential risk to economic status, human life, health, or the environment"

Information usability: Context coverage

Similar to freedom from risk, information context coverage was recently introduced in ISO 25010 (2011) as well. It is the degree in which the information product can be used in different contexts. It is quantifiable for instance by counting the different users of an information product.

Information usability: Satisfaction

I should include further that Satisfaction is one of the criteria that needs more clarification. If a user is satisfied with the information, it is not clear on what aspect of theinformation the user is satisfied with. This means it is not clear on how to improve the information.

While producing information costs money, information as such doesn't necessarily carry monetary value; it mostly carries intellectual, social, artistic, practical value. Information is not necessarily connected to a physical good (paper) or a concrete service (the delivery), or a limited quantity anymore, making it difficult to measure its price. People usually have difficulties spending money for digital information because at the end of the transaction, they neither save time nor hold anything concrete or limited in their hands. The aftermath feeling is like buying air. The following are different information categories and what they are worth:

Economic information

Economic information consists of data that helps you to understand the production, exchange, distribution, and consumption of goods and services. Examples: Economic articles, travel guides, buying guides, stock exchange data, patents, advertisement, design, job lists, and classifieds. Following the basic rules of online self-promotion makes economic data an easy sell, because customers can see a direct monetary profit from acquiring the data. For example, Wall Street Journal.

Artistic Information

Art is information composed of data as a means and goal in itself and for itself. Examples: Fiction, Music, Painting, Photography, Poetry. Art is not made to be profitable but as a means for itself and in itself. It doesn't have to be pleasing, it doesn't need to be nice, it doesn't have to be understandable or entertaining, and, first of all, art doesn't have to make money. Art may be or do anything, art doesn't have to be or do anything. Artistic information is free by its own definition. This is the reason why art needs to be tutored, sponsored, supported by the state, by corporations and by the individual.

Scientific Information

Scientific information consists of systematic, verifiable data that provides the foundation of objective knowledge. Examples: Scientific articles, encyclopedias, white papers, medical data. Scientific data has educational and social value. It should not be sold; it should be shared as much as possible. Sharing scientific information is the way to increase scientific knowledge. Like artistic information, scientific information needs to be funded by society; a rational society is built on the knowledge of its citizens.

Practical Information

Practical information carries data that supports the process by which we make decisions. Examples: Political news, parental guides, maps, instruction manuals, manifests. Practical data is comparable to economic data: It saves time and nerves and thus allows us to be more productive.

Entertainment

Selling information other than financial data requires that you entertain. Entertainment makes data commercially attractive. If information that is both intelligent and entertaining is produced, it has high attention value. The attention realized can be monetized through advertisement, sponsoring and selling physical goods. Selling entertainment only works for data that can be accessed passively like movies, music, games, etc.

Unfortunately, entertainment has a very short half-life. The control over entertaining data, and thus: the value of entertaining information literally runs like sand through the hands. Thus, the more entertaining your information, the faster you need to monetize, because it will easily find its way into the public and be distributed freely.

Normative Value of Information

Beware that Marschak (1971) and McGuire (1972) made seminal contributions to this field of work. Decision theory has developed this concept further and the basic assumption is that we always have some preliminary information about the occurrence of events that are related to our decisions. This information or knowledge is represented by an a priori assignment of probability of occurrence to the event and hence a calculated payoff. The apriori probability might be objective or subjective as the case may be and with the knowledge of additional information, the probabilities are modified resulting in a change in the expected payoffs. This approach is however, only good for theoretical discussions as its practical applicability is poor. The problem for such cases has to be highly structured, which is rarely the case in most situations.

Subjective Value of Information

It is the subject view of the information available. It is the subjective perception or impression of the information. This subjective value approach varies widely with individuals. In the subjective valuation of information, no probabilities are calculated. Subjective value of information is the person's (receiver's) comprehensive impression

about the information content.

Expected Value of Information

The expected value of information (EVI) assume that the decision maker will select a decision to maximize expected value, whether before or after getting new information -- that is behave as a rational person according to the tenets of decision theory. They also assume the decision problem formulated as a decision analysis, and so includes these three kinds of variable:

a. one or more decision variables that the decision maker can control,

b. one or more chance variables that are uncertain, whose uncertainty is expressed as a probability distribution,

c. an objective variable that defines the value or utility that you are trying to maximize, or the loss to minimize. The objective should be influenced by at least one decision variable and chance variable

Characteristics of valuable information [SAQ3]

Reading time: 3 Min

You need to cognise that the value of information depends on their usefulness in the decision making process. This value can be judged based on a set of features that can be identified in the information. They are as follows:

• **ACCURATE** - The information you acquire must be true, verifiable, and not deceptive. Accurate career information is based on empirical data and can be validated by comparing sources or checking for internal consistency.

• **CURRENT** - The information you acquire must be applicable to the present time. Keeping information current requires a process of eliminating the old and adding the new. While some types of information are more perishable than others, it is generally accepted that occupation and education information should be reviewed and updated at least annually to be current.

• **RELEVANT** - Relevant information applies to the interests of the individuals who use it for the decisions they are facing. It should reduce your uncertainties about work and education while facilitating choice and planning.

• **SPECIFIC** - For information to be specific, it must contain concrete facts. General observations are often interesting and can provide a background for further analysis, but specific facts are essential to realistic planning and decision making.

• **UNDERSTANDABLE** - People using information must be able to comprehend it before they can use it. Data must be analyzed and converted into words. The content of the message should avoid ambiguities and be informative to the intended audiences.

•**COMPREHENSIVE** - The information you acquire should include all the important categories within its scope of coverage.

• **UNBIASED** – this characteristic is about how much motivation user derive from your information. It is unbiased when the individual or organization delivering the information has no vested interest in the decisions or plans of the people who are receiving the information.

• **ECONOMICAL** - your Information should also be relatively economical. Decision makers must always balance the value of information with the cost of producing it. For example, if collecting the data takes lots of resources and time, it is not economical.

• **SECURE** – your information must have security i.e protected: the value of information could be lost due to issues such as unauthorized user access or intentionally damaging its existence. Therefore, it is important to make steps to protect valuable data and information. For example, use of passwords or encryption to protect data and information.

Table 1.2.1: Eppler's (2003) criteria and descriptions of information quality

Criterion name	Description
Comprehensiveness	Is the scope of information adequate? (not too much nor too little)
Conciseness	Is the information to the point, void of unnecessary elements?
Clarity	Is the information understandable or comprehensible to the target group?
Correctness	Is the information free of distortion, bias, or error?
Accuracy	Is the information precise enough and close enough to reality?
Consistency	Is the information free of contradictions or convention breaks?

Criterion name	Description
Applicability	Can the information be directly applied? Is it useful?
Timeliness	Is the information processed and delivered rapidly without delays?
Traceability	Is the background of the information visible (author, date etc.)?
Maintainability	Can all of the information be organized and updated on ongoing basis?
Interactivity	Can the information process be adapted by the information consumer?
Speed	Can the infrastructure match the user's working pace?
Security	Is the information protected against loss or unauthorized access?
Currency	Is the information up-to-date and not obsolete?
Accessibility	Is there a continuous and unobstructed way to get to the information?
Convenience	Does the information provision correspond to the user's needs and habits?

Summary

We explained the Information value for the user or organization which can be described by using the usability of the information. Information is data of value in planning, decision making and in the execution of organizational functions and management programs. The value of our information depends on its usefulness to us. These Information categories include economic information, artistic information, scientific information, practical information and entertainment. The value of our information can be normative or subjective. Characteristics of valuable information include: comprehensiveness, conciseness, clarity, correctness, accuracy, consistency, applicability, timeliness, traceability, maintainability, interactivity, speed, security, currency.

Self-Assessment Questions

1. Explain the term "Value of Information".
2. Describe four information categories and their worth.
3. Mention and explain five Characteristics of valuable information.

Tutor Marked Assignment

1. Mention and explain five Characteristics of valuable information.
2. Distinguish between normative and subjective value of information.
3. For information to be specific, it must contain _____ facts.
4. _____ Information is detrimental in nature because they are false and can mislead.

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Digit counter
Nick Hillier by unsplash

Unit 2

QUANTITATIVE WAYS OF MEASURING THE VALUE OF INFORMATION

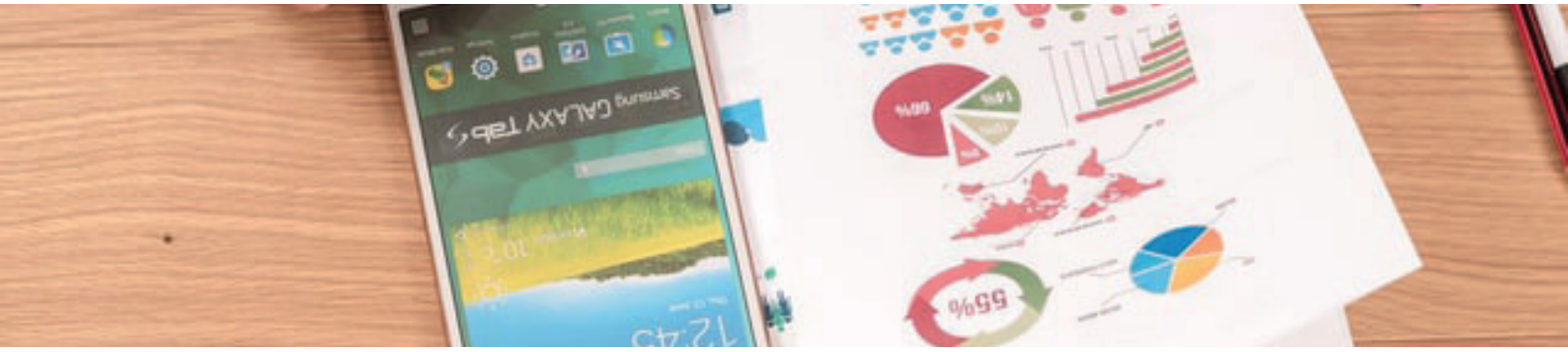
Introduction

In this unit, I will explain information value by means of mathematical formulas, but you know that information value goes beyond the cost, and is dependent upon the usefulness to us. Thus, I focus on some quantitative ways different authors have tried to use to measure the value of information.

Learning Outcomes

At the end of this unit, you should be able to:

- Explain the cost benefit analysis method of measuring the value of information using appropriate example.
  Measure the cost of not having information
- Discuss the willingness to pay approach of measuring the value of information
- Describe the producer's approach of measuring the value of information.



information data
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Main Content

QUANTITATIVE WAYS OF MEASURING THE VALUE OF INFORMATION

Cost Benefit Analysis [SAQ1]

Reading time: 4 Min

Do you know that the cost benefit analysis enables one to weigh the cost of acquiring a piece of information to the benefit derived from the use of that information? Assuming you obtained a piece of information from the front page of Guardian Newspaper, the cost is N40 paid for the purchase of the newspaper. On the other hand, if the information is free, the cost of acquiring the information is the transport fare you use to obtain information from the source; and if the person is mobile, the cost will be the amount you used to fuel your car. Aside the cost, you weigh the benefit derived from the use of the information.

In addition, a cost-benefit analysis is a process businesses use to analyze decisions. The business or analyst sums the benefits of a situation or action and then subtracts the costs associated with taking that action. Some consultants or analysts also build models to assign a dollar value on intangible items, such as the benefits and costs associated with living in a certain town. Before building a new plant or taking on a new project, prudent managers conduct a cost-benefit analysis to evaluate all the potential costs and revenues that a company might generate from the project. The outcome of the analysis will determine whether the project is financially feasible or if the company should pursue another project. In many models, a cost-benefit analysis will help us factor out the opportunity cost into the decision-making process. Opportunity costs are alternative benefits that could have been realized when choosing one alternative over another.

In other words, the opportunity cost is the forgone or missed opportunity as a result of a choice or decision. Factoring in opportunity costs allows project managers to weigh the benefits from alternative courses of action and not merely the current path or choice being considered in the cost-benefit analysis. By considering all options and the potential missed options and the potential missed opportunities, the cost-benefit analysis is more thorough and allow us to make better decision.

In summary:

We have explained the cost-benefit analysis (CBA) is the process used to measure the benefits of a decision or taking action minus the costs associated with taking that action, CBA allows us make measurable financial metrics such as revenue earned or costs saved as a result of the decision to pursue a project and it can help us include intangible benefits and costs or effects from a decision such as employee morale and customer satisfaction.

The Cost-Benefit Analysis Process

A cost-benefit analysis (CBA) should begin with compiling a comprehensive list of all the costs and benefits associated with the project or decision. The costs involved in a CBA might include the following:

1. Direct costs would be direct labor involved in manufacturing, inventory, raw materials, manufacturing expenses.
2. Indirect costs might include electricity, overhead costs from management, rent, utilities.
3. Intangible costs such as customer impact of pursuing a new business strategy, project, or construction of a manufacturing plant, delivery delays of product, employee impact.
4. Opportunity costs such as alternative investments, or buying a plant versus building one.

Benefits might include the following:

1. Revenue and sales increases from increased production or new product.
2. Intangible benefits, such as improved employee safety and morale, as well as customer satisfaction due to enhanced product offerings or faster delivery.
3. Competitive advantage or market share gained as a result of the decision.

An analyst or project manager applies a monetary measurement to all of the items on the cost-benefit list, taking special care not to underestimate costs or overestimate benefits. A conservative approach with a conscious effort to avoid any subjective tendencies when calculating estimates is best suited when assigning a value to both costs and benefits for a cost-benefit analysis. Then, the results of the aggregate costs and benefits is compared quantitatively to determine if the benefits outweigh the costs. If so, then the rational decision is to go forward with the project. If not, the business should review the project or decision to see if it can make adjustments to either increase benefits or decrease costs to make the project or decision viable. Else, the organization is advised to avoid the project or taking the decision.

Limitations of Cost-Benefit Analysis

1. For projects that involve small- to mid-level capital expenditures and are short to intermediate in terms of time to completion, an in-depth cost-benefit analysis may be sufficient enough to make a well-informed, rational decision. For very large projects with a long-term time horizon, a cost-benefit analysis might fail to account for important financial concerns such as inflation, interest rates, varying cash flows, and the present value of money.

2. Alternative capital budgeting analysis methods, including net present value, could be more appropriate for these situations. The concept of present value states that an amount of money or cash in the present day is worth more than receiving the amount in the future since today's money could be invested and earn income.

3. One of the benefits of using net present value for deciding on a project is that it uses an alternative rate of return that could be earned if the project had never been done. That return is discounted from the results. In other words, the project needs to earn at least more than the rate of return that could be earned elsewhere or the discount rate.

4. However, with any type of model used in performing a cost-benefit analysis, there are a significant amount of forecasts built into the models. The forecasts used in any CBA might include future revenue or sales, alternative rates of return, expected costs, and expected future cash flows. If one or two of the forecasts are off, the CBA results

would likely be thrown into question, thus highlighting the limitations in performing a cost-benefit analysis.

Cost of not having the information

This is the cost incurred for not having a piece of information at the right time. For instance, assuming you have a conference to attend at Abuja, on getting there you were told that the conference had been postponed; and a letter was sent to you to that effect but had not been received. The cost of that piece of information that was sent to you, but was not received is what it cost you to travel to and fro to Abuja. The value of that piece of information is the cost incurred for not having the information at the right time.

Cost of not having the information [SAQ2]

This is the cost incurred for not having a piece of information at the right time. For instance, assuming you have a conference to attend at Abuja, on getting there you were told that the conference had been postponed; and a letter was sent to you to that effect but had not been received. The cost of that piece of information that was sent to you, but was not received is what it cost you to travel to and fro to Abuja. The value of that piece of information is the cost incurred for not having the information at the right time.

Willingness to Pay (Users Approach) [SAQ3]

The value you place on a piece of information is determined by your willingness to pay for that piece of information. For instance, there is scarcity of fuel, and somebody has information of where you can purchase fuel and has asked you to pay for the information. The amount you pay to that person is determined by the value you place on that piece of information.

Producer's determination (Demand Approach) [SAQ4]

Reading time: 1 Min

If there is high demand for a piece of information, it means that the value of that information is high, therefore the producer determining the cost of acquiring that information. E.g. rendering an information service that is of high demand to the public.

Information as a Valuable but Unvalued Asset

Do you know that Information is increasingly being recognised as a key economic resource and as one of the firm's most important assets but despite gaining recognition as an asset in its own right, information has so far resisted quantitative measurement? While it consumes vast and ever increasing quantities of organisational resources in terms of data capture, storage, processing and maintenance, it typically receives no financial recognition on the balance sheet.

While hardware and (rarely) software assets are capitalised, the valuation of information has been largely ignored, even though this is a much more valuable asset from a business viewpoint. Hardware and software are merely mechanisms used to create and maintain information— information is the underlying business asset that is produced and maintained by this technology. Information provides the capability to deliver services, make better decisions, improve performance, achieve competitive advantage and can also be sold directly as a product in its own right.

If we consider using a manufacturing analogy:

1. Data is the raw material
2. Software and hardware are the plant and equipment
3. Information is the end product that is delivered to the customer.

The overwhelming component of both the cost and value of an information system resides in the information stored rather than the hardware and software used to store it.

Summary

We have learnt information is calculated with respect to its usage in decision making and return on benefits due to the decision taken. The different quantitative ways we use to determine the value of information has been discussed, these include cost benefit analysis, cost of not having the information, willingness to pay and producer's determination

Self-Assessment Questions

1. How can you apply the cost benefit analysis of measuring the value of information in a hypothetical scenario?
2. Describe using appropriate example how to measure the cost of not having information.
3. Discuss the willingness to pay approach of measuring the value of information.
4. Explain the producer's approach of measuring the value of information.

Tutor Marked Assignments

1. Explain three ways the value of information can be determined quantitatively.
2. There is actually no unit of measurement of information as the value of information depends on its usefulness to the user. Discuss.
3. Compare and contrast two quantitative ways of valuing information.
4. When is the value of information said to be zero?
5. Give a suitable example of the cost benefit analysis of valuing information.
6. One way of determining the value of information is by your unwillingness to pay for that piece of information. True or False.
7. If there is ample demand for a piece of information, it means that the value of that information is _____.
8. There is a cost incurred for not having a piece of information at the right time. True or False

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Magnifying glass
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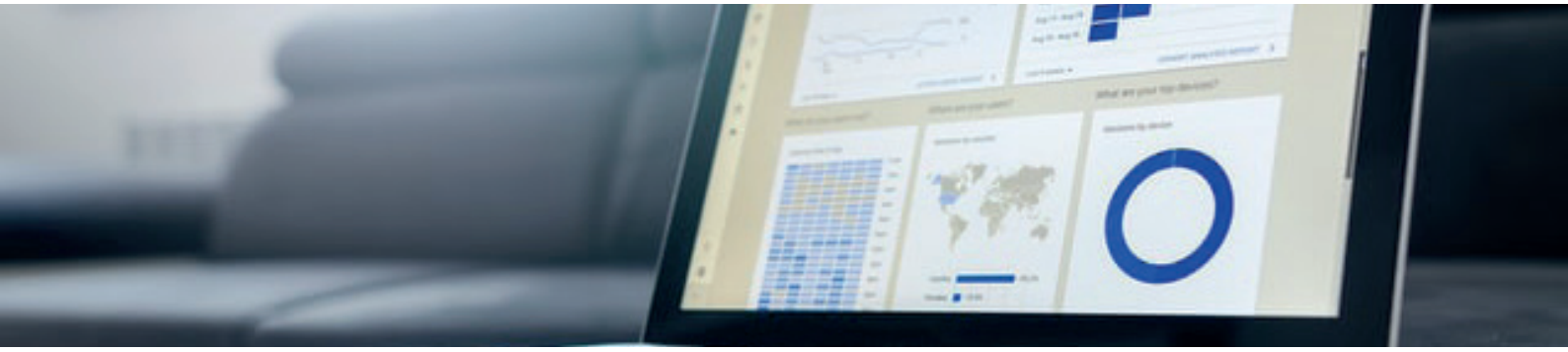
MODULE 3

Meaning and Types of information systems

Units



Data Chart and graph
Source: pexels, (serpstat)

Unit 1

Meaning and Types of information systems

Introduction

You will observe that for most businesses, there are a variety of requirements for information. Senior managers need information to help with their business planning. Middle management need more detailed information to help them monitor and control business activities. Employees with operational roles need information to help them carry out their duties. As a result, businesses tend to have several "information systems" operating at the same time. In this unit, I will highlights the main categories of information system and provides some examples to help you distinguish between them. It also details types of information systems and its components.

Learning Outcomes

At the end of this unit, you should be able to:

- Define an information system
- Describe the different types of information system
- Identify the main components of information systems

Data coding
Source: markus spiske by unsplash

Main Content

MEANING AND TYPES OF INFORMATION SYSTEMS

Reading time: 1 Min

What is an information system? [SAQ1]

An information system is defined as a means we use to provide information in such a way that it will be most useful to the persons for whom it is intended (Tiamiyu, 2003). In other words, an information system comprises of complementary activities that are performed towards a common objectives of facilitating information flow within a community, department or unit within an organization.cilitating information flow within a community, department or unit within an organization.

Information systems are usually established to facilitate such activities as the creation, organization, storage, retrieval, transfer, computation and use of data. Such activities require material and human resources with a technology to create and process data into more valuable data and information.

You will observe that Information systems vary greatly in their objectives, scope and complexity. For instance in an organization, an information system comprises of smaller interconnecting sub-systems that serve the needs of particular departments, units, workgroups or personnel in the organization.

An organization provides the forum where human, paper-based (manual), computerized and other information systems overlap and interface with one another across departments and units.

The various departments and units that can make up an organizational information system include the following:

1. Central administration department including strategic planning, finance, personnel and public relations.
2. Production department
3. Sales /marketing, purchasing and inventory department.
4. Research and development department.

Each of these units has overlapping functions whereby the output of one serves as an input to another i.e they interface with one another.

Types of Information Systems [SAQ2]

Reading time: 4 Min

Transaction processing system (TPS): A TPS collects and stores information about transactions, and controls some aspects of transactions. A transaction is an event of interest to the organisation. e.g. a sale at a store.

Fig 1.3.1: A Transaction Processing System

A TPS is a basic business system.

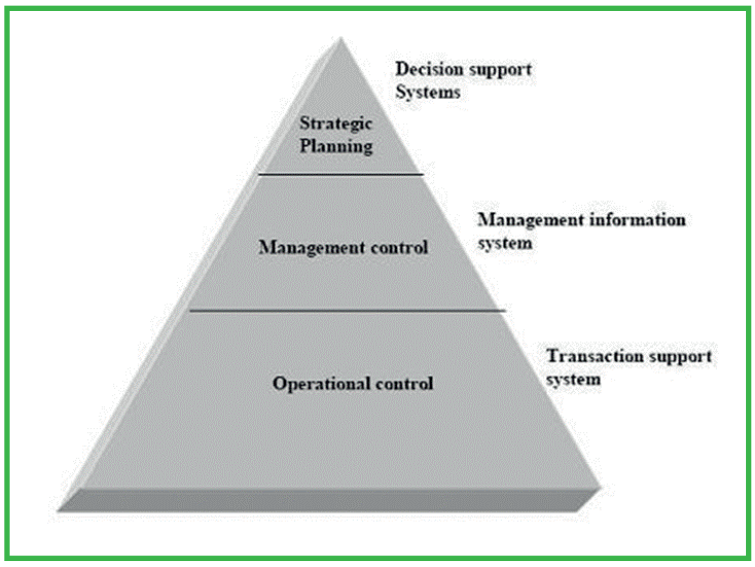
It is often tied to other systems such as the inventory system which tracks stock supplies and triggers reordering when stocks get low;

- serves the most elementary day-to-day activities of an organisation;
- supports the operational level of the business;
- supplies data for higher-level management decisions (e.g. MIS, EIS);
- is often critical to survival of the organisation;

- mostly for predefined, structured tasks;
- can have strategic consequences (eg airline reservation system);
- usually has high volumes of input and output;
- provides data which is summarised into information by systems used by higher levels of management;
- need to be fault-tolerant.

Decision support system (DSS): Helps strategic management staff (often senior managers) make decisions by providing information, models, or analysis tools. For support of semi structured and unstructured decisions (structured decisions can be automated). Used for analytical work rather than general office support. They are flexible, adaptable and quick. The user controls inputs and outputs. They support the decision process and often are sophisticated modelling tools so managers can make simulations and predictions. Their inputs are aggregate data, and they produce projections. An example job for a DSS would be a 5 year operating plan.

Management information system (MIS): Condenses and converts TPS data into information for monitoring performance and managing an organisation. Transactions recorded in a TPS are analyzed and reported by an MIS. They have large quantities of input data and they produce summary reports as output. Used by middle managers. An example is an annual budgeting system.



TAKE NOTE

Fig 1.3.2: Relation of information systems to levels of organization

Executive information system (EIS): Also known as an Executive Support System (ESS), it provides executives information in a readily accessible, interactive format. They are a form of MIS intended for top-level executive use. An EIS/ESS usually allows summary over the entire organisation and also allows drilling down to specific levels of detail. They also use data produced by the ground-level TPS so the executives can gain an overview of the entire organisation. Used by top level (strategic) management. They are designed to the individual.

They let the CEO of an organisation tie in to all levels of the organisation. They are very expensive to run and require extensive staff support to operate.

A good way to think about an EIS/ESS is to imagine the senior management team in an aircraft cockpit - with the instrument panel showing them the status of all the key business activities. ESS/EIS typically involve lots of data analysis and modelling tools such as "what-if" analysis to help strategic decision-making.

Office automation system (OAS): OAS provides individuals with effective ways to process personal and organisational data, perform calculations, and create documents. e.g. word processing, spreadsheets, file managers, personal calendars, presentation packages. They are used for increasing personal productivity and reducing "paper warfare". OAS software tools are often integrated (e.g. Word processor can import a graph from a spreadsheet) and designed for easy operation.

Communication systems: helps people work together by sharing information in many different forms. Teleconferencing (including audioconferencing, computer conferencing, videoconferencing), electronic mail, voice mail, fax.

Groupware system: helps teams work together by providing access to team data, structuring communication, and making it easier to schedule meetings. For sharing information, controlling work flows, communication/integration of work.

Knowledge Management Systems ("KMS"): KMS exist to help businesses create and share information. These are typically used in a business where employees create new knowledge and expertise - which can then be shared by other people in the organisation to create further commercial opportunities. Good examples include firms of lawyers, accountants and management consultants. KMS are built around

systems which allow efficient categorisation and distribution of knowledge. For example, the knowledge itself might be contained in word processing documents, spreadsheets, PowerPoint presentations. internet pages or whatever.

Components of an information system

You will observe that information system is composed of all the components that collect, manipulate and disseminate data or information. It includes hardware, software, people, communication systems, procedures and data itself. The activities of an information system Centre on inputting data, processing of data into information, storage of data and information and the production of output for the end users such as Management report.

The components of an information system are outlined below:

• **Human Resources**: This constitutes the organizational personnel who act as decision makers, operational level staff, data collectors, computer system operators and managers.

• **Socio-organizational framework**: It comprises policies, procedures and social networks governing the relationships among personnel; between personnel and the organization; between personnel and their work; between personnel and information; and between personnel and data processing equipment.

• **Computer and telecommunication hardware**: Computer hardware and telecommunication facilities are needed to facilitate the inputting, processing and storage of data. It could also aid the transfer of data from one source to another.

• **Computer software**: These are sets of instructions that are used to determine the type of processing to be performed on data and information. For instance there are various applications software which can be utilized for processing data and information.

• **Data and information**: These are potentially informative symbols recorded as words, numbers or graphs in memos, forms, data sheets, tables, computer files, reports etc.

Summary

We have learnt how Organisations and individuals use different types of systems for different purposes. Technologically, information systems are enabled by core software, database, and networking technologies, outlined and discussed the main types of information systems and their uses. An information system is defined as a means of providing information in such a way that it will be most useful to the persons for whom it is intended. Types of Information Systems include: Transaction processing system (TPS), Decision support system (DSS), Management information system (MIS), Executive information system (EIS), Office automation system (OAS), Knowledge Management Systems (KMS) and Expert Systems. The components of an information system are human resources; socio-organizational framework; computer and telecommunication hardware; computer software; and data and information.

Self-Assessment Questions

1. What is an information system?
2. State and explain the different types of information systems.
3. Identify and describe the main components of information systems.

Tutor-Marked Assignment

1. A _____ supplies data for higher-level management decisions (e.g. MIS, EIS).
2. _____ Condenses and converts TPS data into information for monitoring performance and managing an organization.
3. _____ is also known as an Executive Support System (ESS).
4. Office automation system (OAS) sub species are _____ and _____.
5. Explain two types of information systems you know.
6. With appropriate example, explain what an expert system is.
7. Mention three advantages of an expert system.
8. Differentiate between executive information system and office automation system

References

Galliers, R. D., Markus, M. L., & Newell, S. (Eds.) (2006). Exploring Information Systems Research Approaches. New York, NY: Routledge.

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Further Reading

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Internet channel
Source: pexels, panumas nikhomkhai

Unit 2

Information Systems development and methodology

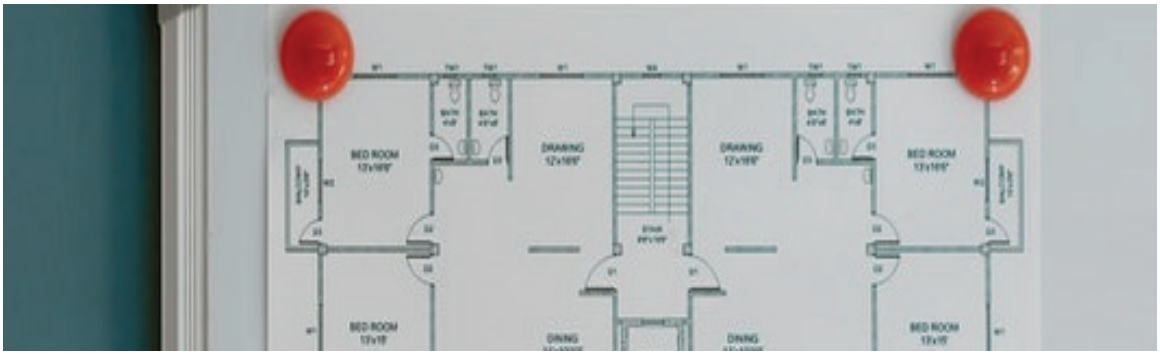
Introduction

In this unit we are going to learn how an information system development methodology is defined as a system of procedures, techniques, tools and documentation which help system developers to implement a new system according to Avison and Fitzgerald (1995). I will explain how there is no standard methodology to be adopted for every problem situation in system development. The main problem for most system analyst is which methodology or which combination of methodologies to adopt in solving a particular problem. This unit is concerned with information systems development and methodology starting from the problem definition and requirement specification stage up to the post implementation evaluation stage.

Learning Outcomes

At the end of this unit, you should be able to:

- Explain the stages in the information system development
- Describe each stage of the information system development
- Analyze an existing information system with a view to recommend a candidate system.



Building plan
Source: pexel,anete lusina

Main Content

INFORMATION SYSTEMS DEVELOPMENT AND METHODOLOGY [SAQ1-3]

Reading time: 5 Min

Problem Definition and Requirement Specification

This is the stage during which problems or deficiencies associated with an existing information system are articulated. The problem of the old system will determine the requirement to be met by the proposed system.

System Analysis and Feasibility Study

Analyzing the existing system in detail and proposing alternative system that could meet the requirement of the new system. The alternatives systems are analyzed to such a depth as to determining which of the alternatives are feasible and cost effective. In the analysis phase, end user business requirements are analyzed and project goals converted into the defined system functions that the organization intends to develop.

The three primary activities involved in the analysis phase are as follows:

1. Gathering business requirement
2. Creating process diagrams
3. Performing a detailed analysis

You should be notified that businessBusiness requirement gathering is the most crucial part at this level of SDLC. Business requirements are a brief set of business functionalities that the system needs to meet in order to be successful. Technical details such as the types of technology used in the implementation of the system need not be defined in this phase. A sample business requirement might look like "The system must track all the employees by their respective department, region, and the designation". This requirement is showing no such detail as to how the system is going to implement this requirement, but rather what the system must do with respect to the business.

Feasibility is defined as the practical extent to which a project can be performed successfully. To evaluate feasibility, a feasibility study is performed, which determines whether the solution considered to accomplish the requirements is practical and workable in the software. Information such as resource availability, cost estimation for software development, benefits of the software to the organization after it is developed and cost to be incurred on its maintenance are considered during the feasibility study. The objective of the feasibility study is to establish the reasons for developing the software that is acceptable to users, adaptable to change and conformable to established standards. Various other objectives of feasibility study include:

1. To analyze whether the software will meet organizational requirements.
2. To determine whether the software can be implemented using the current technology and within the specified budget and schedule.
3. To determine whether the software can be integrated with other existing software.

Types of Feasibility

It is important to note that various types of feasibility that are commonly considered include technical feasibility, operational feasibility, and economic feasibility. Technical feasibility assesses the current resources (such as hardware and software) and technology, which are required to accomplish user requirements in the software within the allocated time and budget. For this, the software development team ascertains whether the current resources and technology can be upgraded or added in the software to accomplish specified user requirements. Technical feasibility also performs the following tasks:

1. Analyzes the technical skills and capabilities of the software development team members.
2. Determines whether the relevant technology is stable and established.
3. Ascertains that the technology chosen for software development has a large number of users so that they can be co nsulted when problems arise or improvements are required.

Operational feasibility assesses the extent to which the required software performs a series of steps to solve business problems and user requirements. This feasibility is dependent on human resources (software development team) and involves visualizing whether the software will operate after it is developed and be operative once it is installed. Operational feasibility also performs the following tasks:
1. Determines whether the problems anticipated in user requirements are of high priority.
2. Determines whether the solution suggested by the software development team is acceptable.
3. Analyzes whether users will adapt to a new software.
4. Determines whether the organization is satisfied by the alternative solutions proposed by the software development team.

We use economic conomic feasibility to determines whether the required software is capable of generating financial gains for an organization. It involves the cost incurred on the software development team, estimated cost of hardware and software, cost of performing feasibility study, and so on. For this, it is essential to consider expenses made on purchases (such as hardware purchase) and activities required to carry out software development. In addition, it is necessary to consider the benefits that can be achieved by developing the software. Software is said to be economically feasible if it focuses on the following issues:
1. Cost incurred on software development to produce long-term gains for an organization.
2. Cost required to conduct full software investigation (such as requirements elicitation and requirements analysis).
3. Cost of hardware, software, development team, and training.

System Design

The detailed physical and logical design of the proposed new system is performed at this stage. The logical design focuses on what the new system will be doing with data, complete description of data and data flows in terms of input, processing and output data. The physical design provides a complete description of all input and output format, data files, databases, forms, data processing equipment, personnel, software specification, system security, control and operational requirement.

In the design phase, the desired features and operations of the system are described. This phase includes business rules, pseudo-code, screen layouts, and other necessary documentation. The two primary activities involved in the design phase are as follows:

1. Designing of IT infrastructure
2. Designing of system model

To avoid any crash, malfunction, or lack of performance, the IT infrastructure should have solid foundations. In this phase, the specialist recommends the kinds of clients and servers needed on a cost and time basis, and technical feasibility of the system. Also, in this phase, the organization creates interfaces for user interaction. Other than that, data models and entity relationship diagrams (ERDs) are also created in the same phase.

The major goal of systems analysis and design is to improve organizational systems. Often this process involves developing or acquiring application software and training employees to use it. Application software, also called a system, is designed to support a specific organizational function or process, such as inventory management, payroll, or market analysis. The goal of application software is to turn data into information. For example, software developed for the inventory department at a bookstore may keep track of the number of books in stock of the latest best seller. Software for the payroll department may keep track of the changing pay rates of employees. A variety of off-the-shelf application software can be purchased, including WordPerfect, Excel, and PowerPoint. However, off-the-shelf software may not fit the needs of a particular organization, and so the organization must develop its own product.

Programming

The software specifications are coded by programmers into a computer program using a particular programming language. The program is comprehensively tested to remove errors. Complete documentation of the computer program and user manual are produced. In the alternative, a readymade software can be purchased that would meet the data processing requirement of the proposed system.

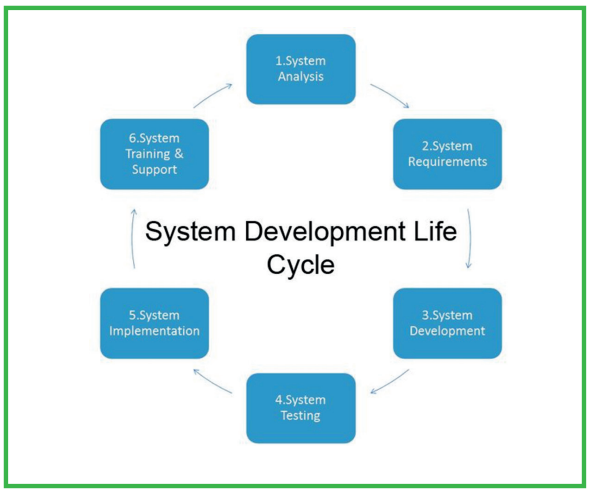
Implementation

The objective of this stage is to provide a working system for the organization by developing an organizational environment in which the system will operate. The task performed at this stage involves installing and testing the complete system within the environment of the organization, site preparation, purchase and installation of equipment and software, training of operators and users of the system, conversion of the existing data into formats that can be used by the system. The old system is run concurrently with the new system before final change over to the new system.

Post Implementation Evaluation

This is done prior to and after complete change over from the old to the new system. The purpose of this review is to ascertain whether the new system is meeting the requirement as originally set. This evaluation will provide a feedback to the system designer as to the correctness of their analysis and design, and might instigate a new system development.

A post-implementation review is a process to evaluate whether the objectives of the project were met. You can also use it to see how effective the project was managed. This helps to avoid making similar mistakes with future projects and learning how to run the project better. Post-implementation review is the last step in your project cycle and usually involves an independent party, which can act more objectively in making their determinations about how the project was run. This provides the stakeholders of the project the confidence to know that the objectives of the project were met successfully.



TAKE NOTE

Figure: 3.2.1: SDLC

Summary

We have learnt that the structured approach to systems development or the traditional approach is an orderly step- by step approach to performing a sequence of activities in the process of developing any type of information referred to as the System Design Life Cycle (SDLC), we have also seen the sequence of activities in the process of the SDLC which are problem definition and requirement specification; system analysis and feasibility study; system design; programming; implementation and post implementation evaluation.

Self-Assessment Questions

List the stages in the information system development.

Describe each stage of the information system development.

Analyze the current system and propose a candidate system of any SME

Tutor-Marked Assignment

1. List the stages involved in the information system development.
2.The detailed physical and logical design of the proposed new system is performed at the _____ stage.
3. The stage during which problems or deficiencies associated with an existing information system are articulated is referred to as _____.
4. What is the full meaning of SDLC?
5. What is information system development methodology?
6. What is the objective of the implementation stage in the SDLC.

References

Gallaugher, J. (2018). Information Systems: A Manager's Guide to Harnessing Technology. Flatworld, Boston.

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Digital counter
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Unit 3

Information Systems Careers

Introduction

In this unit I will discuss various career prospects Information systems has. The careers allows for multi- specialty. A detailed description of each of the careers is given in this unit.

Learning Outcomes

At the end of this unit, you should be able to:

- State the information systems careers that are available
- Discuss the distinctive roles of each information system career.

A lady at Data server room
Source: pexels by christina morillo

Main Content

INFORMATION SYSTEMS CAREERS

SYSTEM ANALYST [SAQ1&2]

Reading time: 3 Min

Do you know a system analyst is a person who selects and configures computer information systems for an Organization or business? The system Analyst job begins with determining the understanding the general objectives of the Organization, the system and user requirements. Once the system analyst has determined the general and specific needs of the system, he can choose an appropriate system that will accomplish the goals of the business.

In addition to what we discussed above , system analysts are IT professionals who act as a mediator between clients and technical team. They are responsible for integrating business requirements into technology and ensure smooth functioning of the business operations. They use both business and technical knowledge for analyzing business processes, computer systems, and infrastructure to develop effective strategies that can help in accomplishing daily needs of the organization. To perform their job, system analysts have to be proficient in programming language, the configuration of systems, and multiple operating systems.

System analysts liaise between customers, IT persons, and stakeholders to develop information systems capable of delivering business requirements. The integration of technology into business requirements has to be futuristic. It means systems analysts have to develop information systems that are easy to upgrade in the future if the need arises.

They have to design an information system architecture according to the user's requirements which acts as a blueprint for the programmers. For that, they need to know exactly what users want and also have to build good relationships and rapport with them to understand their requirements as well as convey correct and complete information to the development team. System analysts are also known as an agent of change since they use different approaches to bring changes in the information system that can facilitate business operations. The biggest hurdle for the role of system analysts is the skepticism of people about accepting the change. So, they prefer users' participation for easy exchange of information. When stakeholders, management, and clients are ready for the technological changes, a final system is made.

In defining a problem or finding reasons for the failure in a system, system analysts play a role of an investigator. They gather information to determine or investigate why an existing system is not working well and is facing problems and what changes should be implemented to solve these issues. After creating alternative solutions for problems, system analysts monitor the information system regularly and take steps to avoid increased costs, and the waste of resources and time.

Responsibilities of System Analysts

Defining User Requirements

The basic and most important step for system analysts is to understand user's requirements clearly. To get the hang, they have to interview users and prepare questionnaires, observe the current system, and plan system configuration. This phase is important to understand how the current system functions and what users want from the new systems. Participation of users is needed so that their views related to the system are taken into consideration to build the new one.

Prioritizing Requirements

Large systems do have various requirements which are not equal and are, therefore, not possible for the team to implement all of them at the same time. Also, various types of users in the organization have different types of information needs that cannot be satisfied due to various constraints such as limited resources, budgetary constraints, time sensitivity, feasibility, etc. Therefore, system analysts have to prioritize users' requirements using their social and analytical skills.

Gathering Data and Facts

System analysts act as researchers and gather various facts and data with the active cooperation from the users of the system. They consult users from time to time to obtain necessary information related to the system, and whether there is any last-minute requirement. This process is important because analysts have to organize and document information into functional specification to solve to develop a system

Analyzing the Problem

After gathering data and facts, system analysts analyze various problems, their causes, and effects on business operations. They analyze and identify the requirements to be fulfilled through technological means. They remove unnecessary data, focus on the important ones, and change or modify the working system accordingly to make it more user-friendly.

Solving Problems

System analysts help IT users to solve information problems by using different approaches in which one good source of solutions is to take suggestions from others. With this approach, analysts develop and evaluate a set of possible alternative solutions and then compare and choose the best one to implement. They have to compare the alternative solutions on the basis of cost, benefits, risk factors, etc. and decide the best with management's help.

Drawing Specifications

System analysts are responsible for drawing precise and clear specifications for programmers and managers to understand easily. That includes text, documents, and flow charts for visual understanding of computer programmers. These are presented in a detailed form as they lay the foundations for optimal functioning of the system.

SYSTEM DESIGNER

Do you know that a system designer is a person who designs, develops and implements the clearly defined information requirement of the new system? This entails planning, designing information systems that integrate hardware, software and communication technologies. Systems designer are usually central to the development and installation of new IT system, which are run in parallel with the old system until all the bugs in the

new system are found and resolved.

Roles of a System Designer

1. Conduct software programming through established design standards.
2. Own or share ownership of game content as per lead.
3. Prototype and iterate on core game mechanics and content.
4. Balance and adjust game-play experiences to ensure product's critical and commercial success.
5. Coordinate with project team members to implement design and work through design revisions.
6. Ensure customer orientation and create use cases on User experience prospection.
7. Maintain specification documentation.
8. Learn proprietary tools quickly and work within a complex asset development pipeline.
9. Iterate over implemented content to enhance flow and game play experience.
10. Write specifications to explain new content and consider feedback for documentation.
11. Receive constructive criticism and respond positively.
12. Inform management and JCI contractor or customer of issues and progress.
13. Perform site training for owner on total system.
14. Follow safety standards for employee and subcontractor safety.
15. Partner with design team members to develop new game systems and concepts.

SYSTEM PROGRAMMER

Reading time: 1 Min

It will interest you to know that in an IT Organization, a system programmer plays a central role. He installs, customizes and maintains the operating system. He installs or upgrades products that run on the system. Other tasks performed by the system programmer include the following: Planning hardware and software system upgrades and changes in configuration, Training system operators, Performing installation specific customization task, Debugging problems with system software and System wide performance tuning to meet required levels of service.

Roles of a System Programmer

1. Revises, enhances, updates and installs vendor supplied systems software components to optimize performance of the computer systems.
2. Researches specific technical software and related questions and problems from users, management, programming, operating and systems personnel.
3. Coordinates between personnel using the computer systems and vendor support personnel.
4. Implements system backup procedures and participates in recovery operations in the event of destruction of all or part of the operating system or other system components.
5. Reviews, tests and evaluates new versions of operating systems and related software.
6. Converts software specification requirements into appropriate programming languages.
7. Participates in the planning, installation and implementation of equipment interfaces and peripheral devices.
8. Analyzes software specifications for completeness and compatibility with operating system capabilities.
9. Reviews and documents software failures and takes corrective action as directed.
10. Provides technical assistance to applications programming personnel and other appropriate user personnel relating to the operating system.
11. Ensures the security and integrity of all systems and data.

DATABASE SYSTEM ADMINISTRATOR (DBA)

Reading time: 3 Min

The DBA maintains the system software environment for business purposes. He does the day-to-day maintenance of the system to keep them running smoothly. The DBA also ensures the integrity of, and efficient access to data that is stored in the database. Other tasks performed by the DBA include: installing software, adding and deleting users and maintaining user profiles, managing storage devices and printers, managing networks, connectivity and system performance.

Roles of a DBA

A database administrator's (DBA) primary job is to ensure that data is available, protected from loss and corruption, and easily accessible as needed.

Below are some of the chief responsibilities that make up the day-to-day work of a DBA. DSP deliver an outsourced DBA service in the UK, providing Oracle Support and SQL Server Support; whilst mindset and toolset may be different, whether a database resides on-premise or in a Public / Private Cloud, the role of the DBA is not that different. Others include:

- **Software installation and Maintenance**: A DBA often collaborates on the initial installation and configuration of a new Oracle, SQL Server etc database. The system administrator sets up hardware and deploys the operating system for the database server, then the DBA installs the database software and configures it for use. As updates and patches are required, the DBA handles this on-going maintenance. And if a new server is needed, the DBA handles the transfer of data from the existing system to the new platform.

- **Data Extraction, Transformation, and Loading**: Known as ETL, data extraction, transformation, and loading refers to efficiently importing large volumes of data that have been extracted from multiple systems into a data warehouse environment. This external data is cleaned up and transformed to fit the desired format so that it can be imported into a central repository.

- **Specialised Data Handling**: Today's databases can be massive and may contain unstructured data types such as images, documents, or sound and video files. Managing a very large database (VLDB) may require higher-level skills and additional monitoring and tuning to maintain efficiency.

- **Database Backup and Recovery**: DBAs create backup and recovery plans and procedures based on industry best practices, then make sure that the necessary steps are followed. Backups cost time and money, so the DBA may have to persuade management to take necessary precautions to preserve data. System admins or other personnel may actually create the backups, but it is the DBA's responsibility to make sure that everything is done on schedule.

In the case of a server failure or other form of data loss, the DBA will use existing backups to restore lost information to the system. Different types of failures may require different recovery strategies, and the DBA must be prepared for any eventuality. With technology change, it is becoming ever more typical for a DBA to backup databases to the cloud, Oracle Cloud for Oracle Databases and MS Azure for SQL Server.

- **Security**: A DBA needs to know potential weaknesses of the database software and the company's overall system and work to minimise risks. No system is one hundred per cent immune to attacks, but implementing best practices can minimise risks. In the case of a security breach or irregularity, the DBA can consult audit logs to see who has done what to the data. Audit trails are also important when working with regulated data.

- **Authentication:** Setting up employee access is an important aspect of database security. DBAs control who has access and what type of access they are allowed. For instance, a user may have permission to see only certain pieces of information, or they may be denied the ability to make changes to the system.

- **Capacity Planning**: The DBA needs to know how large the database currently is and how fast it is growing in order to make predictions about future needs. Storage refers to how much room the database takes up in server and backup space. Capacity refers to usage level. If the company is growing quickly and adding many new users, the DBA will have to create the capacity to handle the extra workload.

- **Performance Monitoring**: Monitoring databases for performance issues is part of the on-going system maintenance a DBA performs. If some part of the system is slowing down processing, the DBA may need to make configuration changes to the software or add additional hardware capacity. Many types of monitoring tools are available, and part of the DBA's job is to understand what they need to track to improve the system. 3rd party organisations can be ideal for outsourcing this aspect, but make sure they offer modern DBA support.

- **Database Tuning**: Performance monitoring shows where the database should be tweaked to operate as efficiently as possible. The physical configuration, the way the database is indexed, and how queries are handled can all have a dramatic effect on database performance. With effective monitoring, it is possible to proactively tune a system based on application and usage instead of waiting until a problem develops.

- **Troubleshooting**: DBAs are on call for troubleshooting in case of any problems. Whether they need to quickly restore lost data or correct an issue to minimise damage, a DBA needs to quickly understand and respond to problems when they occur.

INFORMATION TECHNOLOGIST(2mins)

You will notice that Information technologists operate, maintain and control information systems and equipment. In some organizations they are referred to as information support personnel or communication support specialist. Chief technology officers, for example, often look out for new products and developments in information technology to keep their organizations relevant and up to date.

Duties of an information technology specialist can include network management, software development and database administration. IT specialists may also provide technical support to a business or an organization's employees and train non-technical workers on the business's information systems. Advanced information technology specialists may design systems and assess the effectiveness of technology resources already in use or new systems that are being implemented. Additionally, they will determine the practicality of changes and modification of systems.

IT specialists will also work with external partners, including consultants, agencies and vendors, to arrive at the most appropriate system or integration of multiple systems. With information technology constantly changing, specialists must stay up-to-date on emerging technologies and the potential effectiveness of these advancements in their current system.

INFORMATION MANAGERS

Information Managers plan, develop coordinate and control information systems, human and material resources needed for the systems and processing. The main role of an information Manager is to coordinate activities, sub systems and services under him. They are also called Director of information services.

Information systems managers assist in constructing business plans, overseeing network security and directing Internet operations. After consulting with the business about what it wishes to achieve and what its ultimate goal is in using technology, information systems managers coordinate the efforts of other computer experts, such as systems analysts, computer programmers and support specialists, to help meet the goals of the business. Specific duties of managers differ among different types of managers.

The Information Manager is responsible for maintaining data quality. They must be aware of what documents and records are archived, in storage or needed most often to avoid duplicates and time wasted searching for information. This data needs to be processed efficiently and securely to aide business organization and avoid legal issues such as data breaches.

Information Managers should also focus on consistently improving the organization's agility, to prevent business staff from spending valuable time on searching for records or data they require. Both data security and the cost-effectiveness of the information management strategy in place should always be improved as their results are variable and change often.

In the rapidly evolving digital world, Information Managers should also be aware of changes to security threats and adapt to them quickly. This will allow businesses to avoid legal issues as a result of data breaches or lost information.

With so many aspects involved in the role of an Information Manager, it's easy to understand why many businesses outsource their information management to leading service providers in the industry. At Grace, we utilise a team of highly skilled and trained Information Management specialists to look after all aspects of records, data and information.

Summary

We have learnt Information Systems is a dynamic career field focused on the employment of various information technologies that have increasingly become woven into the fabric of the most value adding processes in organizations, creating a demand for skilled individuals who can think in terms of the company's business, technology, and organizational or "people" strategies in a way that ensures each is aligned with and reinforcing of the other two. We have also covered how various careers in the information systems field works together. A system analyst is a person who selects and configures computer information systems for an Organization or business. A system designer is a person who designs, develops and implements the clearly defined information requirement of the new system. A system programmer plays a central role. He installs, customizes and maintains the operating system. He installs or upgrades products that run on the system. The DBA maintains the system software environment for business purposes. Information technologists operate, maintain and control information systems and equipment. Information Managers plan, develop coordinate and control information systems, human and material resources needed for the systems and processing.

Self-Assessment Questions

1. Describe four information systems careers that you know.
2. Discuss the distinctive roles of a systems analyst and a database administrator.

Tutor-Marked Assignment

1. Explain what you understand by 'information system careers'.
2. List five information system careers you know.
3. The person who operate, maintain and control information systems and equipment is called _____.
4. What is the full meaning of DBA?
5._____ debugs problems with system software.

6. Who is a System Analyst?
7. Describe the roles of an Information Manager.
8. What are the skills an information systems graduate should possess to understand both business processes and the technologies available to support them.

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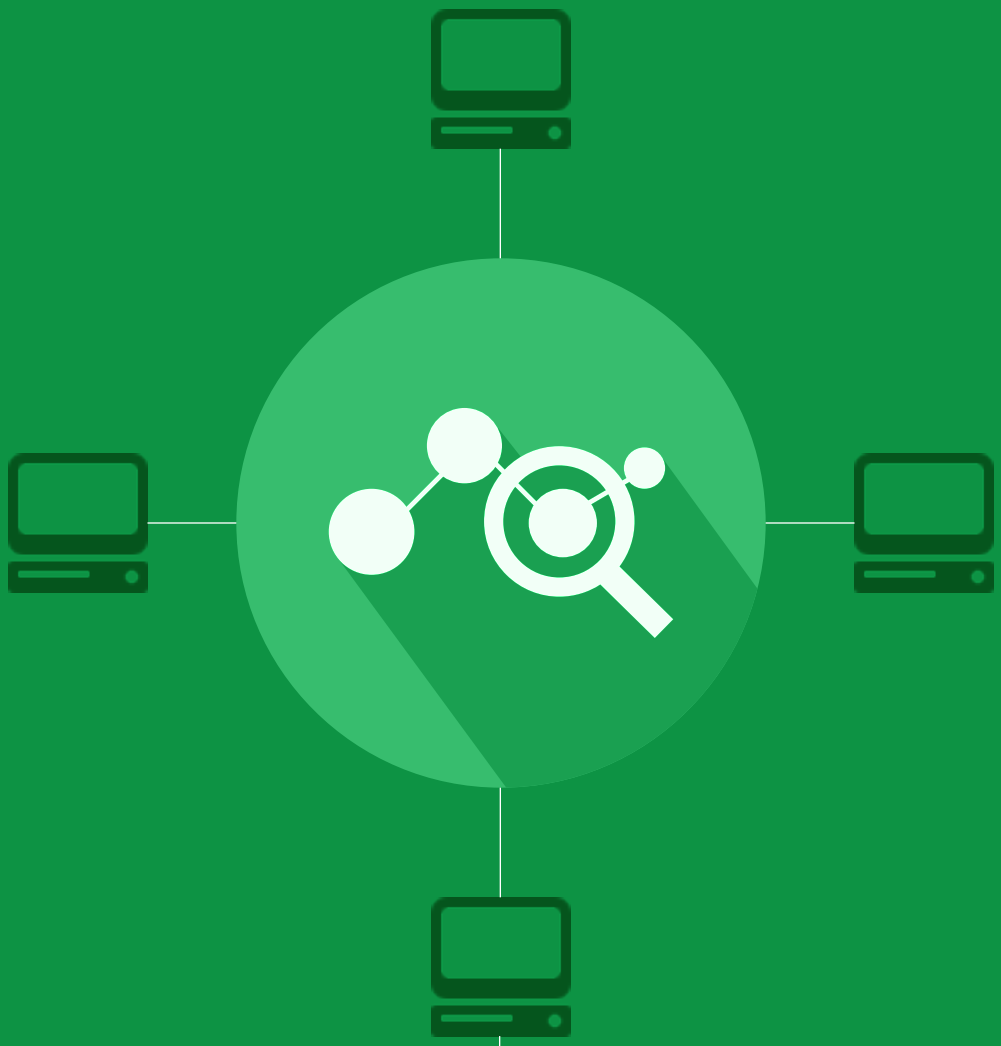
Grey metal tower
source: unsplash (tony stodard)

MODULE 4

CHANNELS OF COMMUNICATION



Units

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Unit 1

Meaning and Process of Communication

Introduction

In this unit, I will introduce you to communication and we will also discuss about the five fundamental factors in the communication

Learning Outcomes

After you have completed this study unit, you should be able to:

- Explain in detail the meaning of communication based on views from different authors
- State the five fundamental factors in the communication process
- Discuss the concept of feedback in the communication process.

light bulb,
Source: pexels, pixabay

Main Content

MEANING AND PROCESS OF COMMUNICATION

Meaning of communication [SAQ1]

Reading time: 1 Min

Communication is the process of exchanging, transmitting, transferring, expressing or imparting ideas, sentiments, attitudes, feelings, meanings, information or opinion between individuals, groups or organisations (Sambe, 2005).

Communication is the transfer of information from a sender to a receiver, with the information being understood by the receiver (Weihrich & Koontz, 2005).
While the definitions of communication vary according to the theoretical frames of reference employed and the stress placed upon certain aspects of the total process, they all include five fundamental factors:

- an initiator
- a recipient
- a mode or vehicle
- a message
- and an effect.

Simply expressed, the communication process begins when a MESSAGE is conceived by a SENDER. It is then ENCODED – translated into a signal or sequence of signals – and TRANSMITTED via a particular MEDIUM or CHANNEL to a RECEIVER who then decodes it and interprets the message, returning a signal in some way that the message has or has not been understood. (Watson & Hill, 2006).

You will find it interesting that Communication is derived from the Latin word communis which means "to share". The science of communication is almost as old as man himself. From time immemorial, the need to share or to communicate had been felt. Different vehicles/channels were identified and subsequently improvised for the purpose of transmission of ideas and concepts. A study of these channels enables us to gain an insight into the process of communication. (Kaul, 2000).

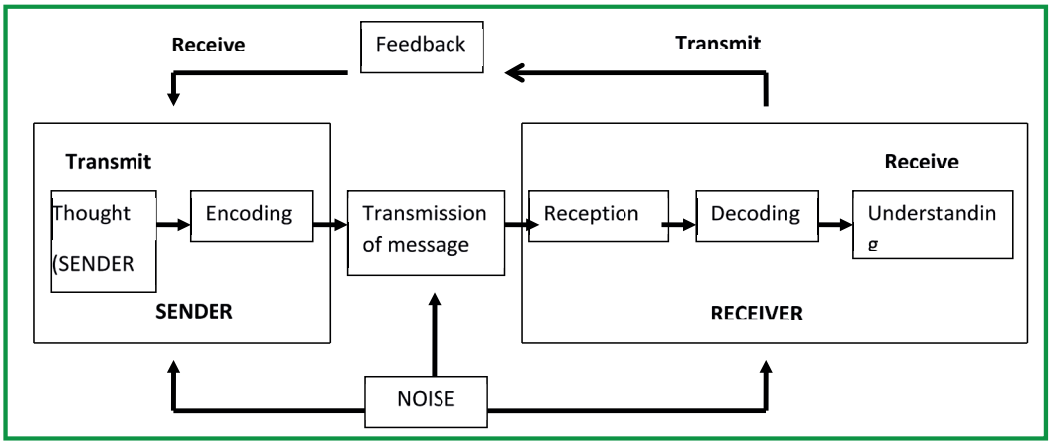

Fig. 4.1.1: A Communication Process Model (adapted from Weihrich & Koontz, 2005, p.444 and Stoner, Freeman & Gilbert, 1995, p.526)

Sender of the Message

Communication begins with the sender, who has a THOUGHT or an idea, which is then encoded in a way that can be understood by both the sender and the receiver. Although it is usual to think of ENCODING a message into a spoken language, there are many other ways of encoding, such as translating the thought into computer language.

Use of a Channel to Transmit the Message

The information is then transmitted over a channel that links the sender with the receiver. The CHANNEL is the formal medium of communication between a sender and a receiver. The message may be oral or written, and its TRANSMISSION may be through face to face, a letter, memorandum, a computer, the telephone, a telegram, e-mail, television, radio, newspaper, magazine, or other media. Television, of course, also facilitates transmission of gestures and other visual clues. At times, two or more channels are used.

In a telephone conversation, for instance, two people may reach a basic agreement that they later confirm by a letter. Since many choices are available, each with advantages and disadvantages, the proper selection of the channel is vital for effective communication.

For example, in "ICTs for Agricultural Livelihoods: Impact and lessons learned from IICD support activities" (p.18), the following table was used to summarise target groups in agriculture and the communication options to address their needs

Examples of local target groups	Appropriate Channels
• Small-scale farmers • Farmers' associations and cooperatives • Local extension agents	• Face-to-face interaction • Drama • Illustrated printed materials • Text-based materials (books, reports) • Multimedia materials including video • Broadcast and Two-way radio • Television • Stand-alone or locally networked computers • Offline databases • Mobile telephony • And where connectivity permits: • e-mail • chat • Internet telephone (VOIP) • Shared web-based systems

Examples of national/ international target groups	Appropriate Channels
• **Ministries of Agriculture** • **Research organisations** • **Supermarket chains** • **Foreign buyers** • **International agencies**	• **Text-based materials (books, reports)** • **DVD/CD based Multimedia** • **Intranet/Internet-based information resources** • **Networked computers/LANs** • **Fax** • **E-mail** • **Web-based dialogue tools and e-Discussion groups** • **Internet telephone (VOIP)** • **Shared web-based systems**

Receiver of the Message

You will also find out the receiver has to be ready for the RECEPTION of the message so that it can be decoded into thoughts. A person thinking about an exciting football game, for example, may pay insufficient attention to what is being said, thus increasing the probability of a communication breakdown. On reception of the message, the next step in the process is DECODING, in which the receiver converts the message into thoughts.

Occurrence of Accurate Communication

You should be aware that an accurate communication can occur only when both the sender and the receiver attach the same, or at least similar, meanings to the symbols that compose the message. Thus, it is obvious that a message encoded into French requires a receiver who understands French. Less obvious, and frequently overlooked, is the fact that a message in technical or professional jargon is not complete unless it is understood. UNDERSTANDING *is in the mind of both the sender and the receiver.*

Persons with closed minds will normally not completely understand messages, especially if the information is contrary to their value system – Note that between computers, accurate communication is taken to be when handshake is achieved between the two ends.

Feedback in Communication

You should bear in mind; Communication can flow in one direction and end there. Or a message can elicit a response – formally known as feedback – from the receiver. To check the effectiveness of communication, a person must have FEEDBACK. One can never be sure whether or not a message has been effectively encoded, transmitted, decoded, and understood until it is confirmed by feedback.

In face to face communication feedback is no problem, because the speaker and the listener both are present and can ask and clarify the message instantly if there is any ambiguity. One can ask the other to repeat what has been missed. They can also observe the- gestures and facial expression in oral communication. But in the case of written communication the feedback is not instant. It requires some time. Whatever may be the mode or channel (i.e., verbal, non-verbal or written), feedback is very important. It is the key which unlocks the success of communication. The objective of communication is bound to remain unfulfilled unless the process of communication is complete with feedback. It is an inseparable part of successful communication.

The process or technique of feedback should include the following steps:

1. Listening and understanding the message properly.
2. Asking question if the message is not understood properly and get it clarified.
3. Understanding the message in the sense originally intended.
4. Conveying the reaction to the sender of the message.

Types of Feedback

You will notice, that Feedback may be positive or negative. Positive feedback is the kind of feedback which is more or less acceptable or satisfactory to the sender. It means that the recipient of the message has responded in the way intended by the sender and taken the intended course of action. It signifies that everything is on the right track and no corrective measure regarding communication is necessary.

Effective feedback needs to be:

Clear: Effective feedback is possible if the recipient understands the message communicated to him/her properly. It should be clear in two respects:

- The sender of the message can understand that the feedback is related to the message sent; and
- The meaning of the feedback should be clear.

The sender of the feedback should take care about it and ensure proper understanding of the feedback by the receiver. Use of simple language for communication is highly necessary.

Well-timed: Feedback may not be instant. It may require some time to get feedback. But much delayed feedback may not be worthwhile or even may not serve any purpose at all. It should be made within a reasonable time.

Specific: In general, feedback, to be effective, should be particular or specific. A generalized response or an ambiguous reply is of little value. To a specific question, specific answer should be given. Sometimes general impression of a large section of people is necessary as feedback. In that case, the communication should be designed in such a way that the people are encouraged to give their general impression.

Bearing Right Attitude: 'I' attitude should be replaced by 'We' or 'You' attitude to get the co-operation of the person with whom communication is being made. If the sender thinks that he/she is superior to the recipient in every respect, it will be reflected in the message and the recipient will feel embarrassed in giving a feedback. Therefore, such attitude should be avoided.

The recipient should also avoid the fault-finding attitude with the sender. If much of the time is spent in finding fault with the subject-matter, presentation skill and similar matters related to the message, the feedback process is sure to suffer. Therefore, both undermining attitude of the sender and fault-finding attitude of the receiver should be avoided to make the feedback effective.

Truly Representative: Feedback may be positive or negative. One should not hesitate to convey negative feedback. Actual, true and honest reaction should be communicated. We should not hesitate to convey our disagreement. We should also clearly state if we fail to understand the message.

Impersonal: Feedback, to be effective, should be free from personal reactions. Let us suppose, Mr. A is depressed due to some personal problems in his life. This state of mind should not be reflected in the feedback process of the official work or business communication. Similarly, any personal rivalry or conflict should not have any influence on official feedback.

Informative: The sender of a message expects from the receiver some information in the form of feedback which the sender does not already know. Therefore, feedback, to be effective, should be informative.

Summary

Communication is a process whereby information is enclosed in a package and is channeled and imparted by a sender to a receiver via some medium. The receiver then decodes the message and gives the sender a feedback. All forms of communication require a sender, a message, and a receiver. Feedback is also essential in communication, for it to be effective, it must be clear, well-timed, specific, truly representative, impersonal and informative.

Self-Assessment Questions

1. Explain in detail the meaning of communication.
2. State and explain the five fundamental factors in the communication process
3. Discuss the concept of feedback in the communication process.

Tutor-Marked Assignment

1. A message cannot be said to have been effectively encoded, transmitted, decoded, and understood until it is confirmed by _____.

2. All forms of communication require a _____, a _____, and a _____.

3. The communication process begins when a MESSAGE is conceived by a _____.

4. The _____ is the formal medium of communication between a sender and a receiver.

5.With the aid of a well labeled diagram, describe the communication process.

6. When does accurate communication occur?

7. Discuss the concept of feedback in communication.

8. Explain in detail each of the five factors in the communication process.

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USB cable
Source: pexels, karolina grabowska

Unit 2

TYPES OF COMMUNICATION CHANNELS

Introduction

In this unit I will explain how Communication can occur via various processes and methods and depending on the channel used and the style of communication there can be various types of communication. I will describe the types of communication and the different levels of communication.

Learning Outcomes

By the end of this unit, you should be able to:

- Explain the various types of communication.
- Describe the levels of communication
- Identify the role of electronic media in communication

Telephone
Source: Pexels by Pixabay

Main Content

TYPES OF COMMUNICATION CHANNELS

Types of communication [SAQ1]

Reading time: 1 Min

a Types of Communication Based on Communication Channels

You will find it amazing to know that based on the channels used for communicating, the process of communication can be broadly classified as verbal communication and non-verbal communication. Verbal communication includes written and oral communication whereas the non-verbal communication includes body language, facial expressions and visual diagrams or pictures used for communication.

Verbal Communication

The spoken word we use to communicate is known as Verbal communication, it is further divided into written and oral communication. The oral communication refers to the spoken words in the communication process. Oral communication can either be face-to-face communication or a conversation over the phone or on the voice chat over the Internet. Spoken conversations or dialogs are influenced by voice modulation, pitch, volume and even the speed and clarity of speaking.

The other type of verbal communication is written communication. Written communication can be either via snail mail, or email. The effectiveness of written communication depends on the style of writing, vocabulary used, grammar, clarity and precision of language.

Non-verbal Communication

The type of communication which involve our body is called Non-verbal communication, it includes the overall body language of the person who is speaking, which will include the body posture, the hand gestures, and overall body movements. The facial expressions also play a major role while communication since the expressions on a person's face say a lot about his/her mood. On the other hand gestures like a handshake, a smile or a hug can independently convey emotions. Non-verbal communication can also be in the form of pictorial representations, signboards, or even photographs, sketches and paintings.

b Types of Communication Based on Style and Purpose

Based on the style of communication, there can be two broad categories of communication, which are formal and informal communication that have their own set of characteristic features.

Formal Communication

You will see that Formal communication includes all the instances where communication has to occur in a set formal format. Typically this can include all sorts of business communication or corporate communication. The style of communication in this form is very formal and official. Official conferences, meetings and written memos and corporate letters are used for communication. Formal communication can also occur between two strangers when they meet for the first time. Hence formal communication is straightforward, official and always precise and has a stringent and rigid tone to it.

Informal Communication

You will also observe that the Informal communication includes instances of free unrestrained communication between people who share a casual rapport with each other. Informal communication requires two people to have a similar wavelength and hence occurs between friends and family. Informal communication does not have any rigid rules and guidelines. Informal conversations need not necessarily have boundaries of time, place or even subjects for that matter since we all know that friendly chats with our loved ones can simply go on and on.

Levels of Communication [SAQ2&3]

Reading time: 4 Min

You will observe that looking broadly the levels of communication can be categorized in a three-fold pattern as intrapersonal, interpersonal, and mass.

Intrapersonal Communication

Intrapersonal communication is internal to the communicator. Intrapersonal communication is the active internal involvement of the individual in symbolic processing of messages. Intrapersonal communication is the thought process or communication with one person or one's self. The individual becomes his or her own sender and receiver, providing feedback to him or herself in an ongoing internal process. It can be useful to envision intrapersonal communication occurring in the mind of the individual in a model which contains a sender, receiver, and feedback loop. Intrapersonal communication can encompass:

- Day-dreaming
- Speaking aloud (talking to oneself)
- Making gestures while thinking: the additional activity, on top of thinking, of body motions, may again increase concentration, assist in problem solving, and assist memory.
- Interpreting non-verbal communication e.g. gestures, eye contact
- Communication between body parts; e.g. "My stomach is telling me it's time for lunch."

Interpersonal Communication

When you observe that the communication occurs primarily between two people or between one person and a group of individuals it is known as interpersonal. It covers all aspects of personal interaction and contact between individuals or members of a group. Effective interpersonal communication depends on a variety of interpersonal skills including listening, asserting, influencing, persuading, empathizing, sensitivity, and diplomacy. Important aspects of communication between people include body language and other forms of nonverbal communication.

Although interpersonal communication can encompass oral, written, and nonverbal forms of communication, the term is usually applied to spoken communication that takes place between two or more individuals on a personal, face-to-face level. Some of the types of interpersonal communication that are commonly used within a business organization include staff meetings, formal project discussions, employee performance reviews, and informal chats.

Interpersonal communication with those outside of the business organization can take a variety of forms as well, including client meetings, employment interviews, or sales visits. In order to understand the principles of effective interpersonal communication, it is helpful to look at the basic process of communication.

Mass Communication

I want you to know that Mass communication describes institutionalized forms of public message production and dissemination, operating on a large scale, involving a considerable division of labour in their production processes and functioning through complex mediations of print, film, recording tape and photography. It is a more public form of communication between an entity and a large and diverse audience, mediated by some form of technology. This may be either real time or on a taped-delay basis or it may be rooted in the recent past. Examples: Radio and television, newspapers and magazines.

Mass communication is a process by which information originates from the source (message) to the receiver (audience/market), having been thoroughly filtered and transmitted through a channel (the medium). Noise may interfere with reception to cause communication breakdown. Its feedback is not instant. It is delayed. The feedback is mostly through letters to the editor or telephone calls or personal calls on the media.

Mass communication is a special kind of communication involving the following distinctive operating conditions:

a. Nature of Audience – directed towards a relatively large, heterogeneous and anonymous audience.

b. The communication experience – characterised as public, rapid, and transient. Public because their message is to an anonymous audience and there open to public

scrutiny, making it a subject for community censorship and control through legislations, public opinion, and other social mechanisms. Rapid because the messages are meant to reach large audiences within a relatively short time or even simultaneously, suggesting potential social power in its impact. Transient because they are usually intended to be consumed immediately, being considered expendable, unless it is saved as permanent records or for re-use e.g. films, libraries, radio transcripts, etc. This transience has led to an emphasis on time lines and sensation in content.
c. The communicator – tends to be or operate within a complex organisation that may involve great expense. The communicator in mass media, traditionally, works through a complex organisation embodying an extensive division of labour an accompanying degree of expense.

The features of mass communication outlined above, can be summarised in the following seven characteristics:
1. They normally require complex formal organisations
2. They are directed towards large audiences
3. They are public – the content is open to all and the distribution is relatively unstructured and informal
4. Audiences are heterogeneous
5. The mass media can establish simultaneous contact with very large numbers of people at a distance from the source, and widely separated from one another
6. The relationship between communicator and audience is addressed by persons known only in their public role as communicators
7. The audience for mass communications is an aggregate of individuals united by a common focus of interest, engaging in an identical form of behaviour and open to activation towards common ends, yet the individuals involved are unknown to each other, have only a restricted amount of interaction, do not orient their actions to each other and are only loosely organised or lacking in organisation.

Electronic Media in Communication

You will see that Organisations are increasingly adopting various electronic devices that improve communication. Electronic equipment includes computers, e-mail systems, cell phones, beepers, fax, instant messaging, etc.

Telecommunication

Telecommunications is the exchange of information over significant distances by electronic means. A complete, single telecommunications circuit consists of two stations, each equipped with a transmitter and a receiver. The transmitter and receiver at any station may be combined into a single device called a transceiver. The medium of signal transmission can be electrical wire or cable (also known as "copper"), optical fibre or electromagnetic fields. The free-space transmission and reception of data by means of electromagnetic fields is called wireless.

The simplest form of telecommunications takes place between two stations. However, it is common for multiple transmitting and receiving stations to exchange data among themselves. Such an arrangement is called a telecommunications network.

The Internet is the largest example. On a smaller scale, examples include:

- Corporate and academic wide-area networks (WANs)
- Telephone networks
- Police and fire communications systems
- Taxicab dispatch networks
- Groups of amateur radio operators

Data is conveyed in a telecommunications circuit by means of an electrical signal called the carrier or carrier wave. In order for a carrier to convey information, some form of modulation is required. The mode of modulation can be broadly categorized as either analogue or digital. In analogue modulation, some aspect of the carrier is varied in a continuous fashion. The oldest form of analogue modulation is amplitude modulation (AM) still used in radio broadcasting at some frequencies. Digital modulation actually predates analogue modulation; the earliest form was Morse code. During the 1900s, dozens of new forms of modulation were developed and deployed, particularly during the so-called "digital revolution" when the use of computers among ordinary citizens became widespread.

In some contexts, a broadcast network, consisting of a single transmitting station and multiple receive-only stations, is considered a form of telecommunications. Radio and television broadcasting are the most common examples.

Telecommunications and broadcasting worldwide are overseen by the International Telecommunication Union (ITU) an agency of the United Nations (UN) with headquarters in Geneva, Switzerland. Most countries have their own agencies that enforce telecommunications regulations formulated by their governments. In the United States, that agency is the Federal Communications Commission (FCC).#

Teleconferencing

Teleconferencing can be described as a group of people who are in different locations interacting with each other by means made possible by the use of telecommunications equipment (audio and video media with moving or still pictures). Full motion video allows participants to hear each other and also see each other's expression as well as visual displays. Advantages of teleconferencing include savings in travel expenses and travel time and can increase the frequency of meetings.

Communication Channels

- Face-to-face interaction
- Drama
- Illustrated printed materials
- Text-based materials (books, reports)
- Multimedia materials including video (DVD/CD based Multimedia)
- Broadcast and Two-way radio
- Television
- Offline databases
- Mobile telephony
- Chat
- Internet telephone (VOIP)
- Intranet/Internet-based information resources
- Networked computers/LANs
- Fax
- E-mail
- Web-based dialogue tools and e-Discussion groups
- Shared web-based systems

Summary

In summary, we have been able to explain the types of communication based on communication channels, and based on style and purpose. The levels of communication categorized in a three-fold pattern were also discussed in this unit.

- Verbal communication is further divided into written and oral communication. Non-verbal communication includes the overall body language of the person who is speaking, which will include the body posture, the hand gestures, and overall body movements. Formal communication includes all the instances where communication has to occur in a set formal format.
- Informal communication includes instances of free unrestrained communication between people who share a casual rapport with each other. Intrapersonal communication is internal to the communicator.
- Interpersonal Communication is the type of communication which occurs primarily between two people or between one person and a group of individuals. Mass communication describes institutionalized forms of public message production and dissemination, operating on a large scale.
- Telecommunications is the exchange of information over significant distances by electronic means. Teleconferencing can be described as a group of people who are in different locations interacting with each other by means made possible by the use of telecommunications equipment.
- Different communication channels include: face-to-face interaction, drama, illustrated printed materials, text-based materials (books, reports), multimedia materials including video (DVD/CD based Multimedia), broadcast and two-way radio, television, offline databases, mobile telephony, chat, Internet telephone (VOIP), intranet/ Internet-based information resources, networked computers/LANs, fax, and e-mail.

Self-Assessment Questions

1. List and explain the various types of communication.
2. State and describe the levels of communication
3. Identify the role of electronic media in communication

Tutor-Marked Assignment

1. Verbal communication includes _____ and _____ communication.
2. _____ and _____ are examples of intrapersonal communication.
3. Audiences in a mass communication are homogeneous. True or False
4. Email is an example of electronic communication. True of False
5. List five channels of communication.
6. What is teleconferencing?
7. What is non-verbal communication?
8. Differentiate between formal and informal communication
9. Explain what you understand by interpersonal communication.

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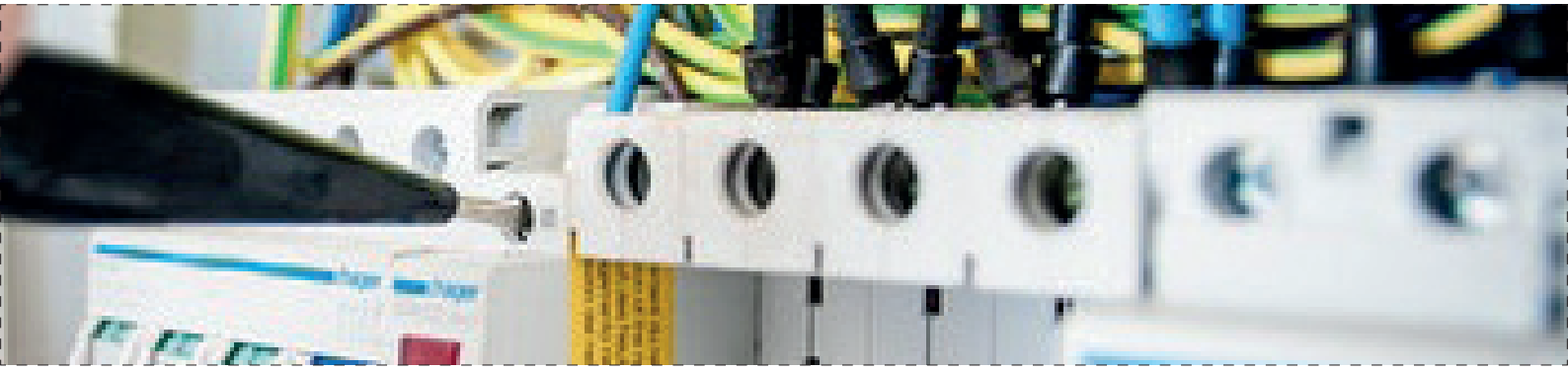


man working on circuit breaker
Source: pexels, pixabay

Unit 3

Barriers and breakdowns in communications

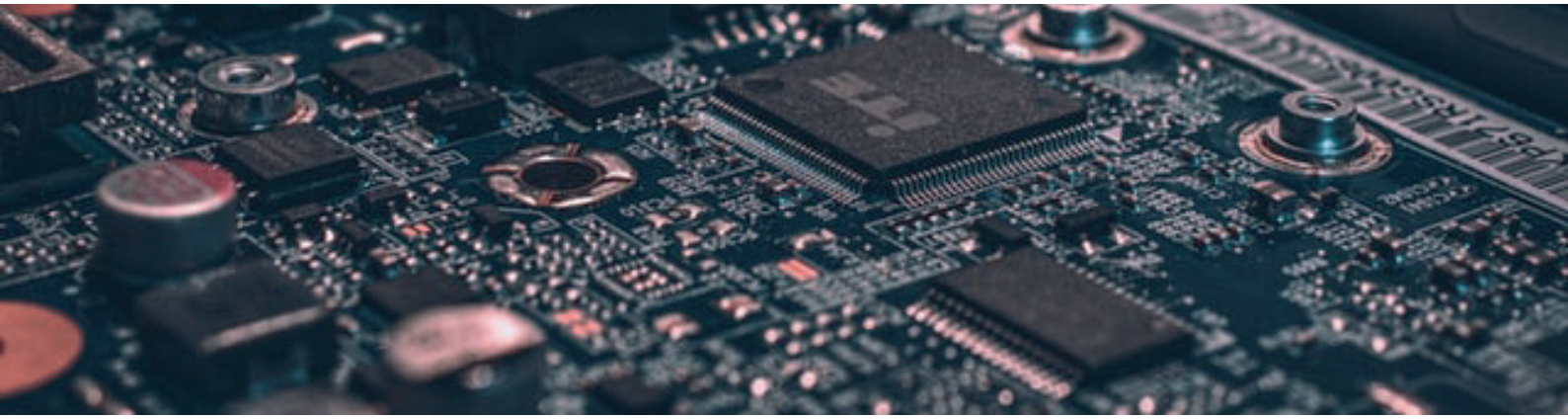
Introduction

Don't forget that Communication is complete if and only if the message sent by the sender is interpreted with same meaning by the receiver. If any kind of disturbance blocks any step of communication, then noise is said to have been introduced. Communication is the lifeline of all business and anything going wrong with it may cost the organization dearly. In this unit I will explain how Communication breakdown is a major challenge facing many organizations and even individuals.

Learning Outcomes

The objectives of this unit to enable you to:

- Explain the factors that constitute barriers to effective communication
- Identify tips for effective communication.



device motherboard panel
Source: Alexander debieve by unsplash

Main Content

BARRIERS AND BREAKDOWNS IN COMMUNICATIONS

Barriers and breakdowns in communication [SAQ1]

Reading time: 1 Min

Noise is anything that confuses, disturbs, diminishes, or interferes with communication. It is anything – whether in the sender, the transmission, or the receiver – that hinders communication. Chand (2019) highlighted the following barriers to communication:

Noise: it is the first and foremost barrier to communication. It means "interference that occurs in a signal and prevents you from hearing sounds properly." In a factory, for example, the continuous noise made by machines makes oral communication difficult. In the same way some technical problem in a public address system or a static in a telephone or television cable will distort the sound signal and affect communication. Adverse weather conditions or some fault in the ultramodern telecommunication systems may also spoil the effect. Noise does not mean only this. It also encompasses many other factors that may exist at the end of sender as well as that of the receiver. The sender may resort to ambiguous or confusing signals. The receiver may mess up the message owing to inattention or may spoil decoding because of wrong or unexpected interpretation. The receiver's prejudices may also come in the way of his understanding the message in the right spirit.

Lack of Planning: Communication is not a casual affair. When taking lightly, the result is that the message to be sent across may not be carefully planned. There are innumerable examples of people who would give an ill-planned, long-winding lecture while a short presentation with tables or graphs would be sufficient. Such an event would turn into one of miscommunication or mal-communication. In the same way some people may not care to choose a suitable time and place that are so necessary for effective communication.

Semantic Problems: Semantics is the systematic study of meaning. That is why the problems arising from expression or transmission of meaning in communication are called semantic problems. Oral or written communication is based on words which are limited in number and may be used in unlimited ways.

You observe that the intended meaning is in the mind of the sender and also in that of the receiver. But it is not always necessary for the meaning in the mind of the sender to be the same as in the mind of receiver. Such, therefore, depends on how the sender encodes his message. The sender has to take care that the receiver does not misconstrue his message, and gets the intended meaning. Quite often it does not happen in this way and this leads to semantic problems. It can be ensured only if clarity, simplicity and brevity are aimed at so that the receiver gets the intended meaning.

Cultural Barriers: Cultural differences often come up as communication barriers. We have to be especially careful in this regard as now we have to operate in international environment. The same category of words, phrases, symbols, actions, colours mean different things to people of different countries or different cultural backgrounds.

For example, in the United States people love to be called by their first names while in Nigeria to a large extent, people like to be addressed by their tiles and last name. In the North American States a sign of 'O' made with the forefinger and thumb stands for 'OK' while in the Southern States it is construed as obscenity.

Wrong Assumptions: Quite often people act on assumptions, without caring to seek clarification for them. All possible efforts should be made to maintain goodwill and not act impulsively on assumptions.

Socio-psychological Barriers: The attitudes and opinions, place in society and status-consciousness arising from one's position in the hierarchical structure of the organisation, one's relations with peers, seniors, juniors and family background - all these deeply affect one's ability to communicate both as a sender and receiver.

peers playing together
Source: unsplash by Wayne Lee Sing

Status consciousness is widely known to be a serious communication barrier in organisations. It leads to psychological distancing which further leads to breakdown of communication or miscommunication. Often it is seen that a man high up in an organisation builds up a wall around himself. This restricts participation of the less powerful in decision-making. In the same way one's family background formulates one's attitude and communication skills.

Emotions: Emotions play a very important role in one's life. Both encoding and decoding of messages are influenced by emotions. A message received when one is emotionally worked up will have a different meaning than when the individual is calm and composed. Anger is considered to be the worst emotion and enemy of communication.

Young man smiling
Source: Unsplash by Elizeu Dias

Selective Perception: Most of the factors cited above lead to selective perception. It means that the receivers selectively see and hear depending upon their needs, background, motivations, experience and other personal characteristics.

Individual in Contact
Source: Unsplash by Jd Mason

While decoding the messages, most of the receivers protect their own interests and expectations into process of communication leading to a particular kind of feedback that may become a communication problem.

Filtering: Filtering means that the sender of a message manipulates information in such a way that it will be seen more favorably by the receiver. A manager, for example, likes to tell his boss what he feels or what his boss wants to hear. In this process, he is filtering information. The net result is that the man at the top never gets objective information.

In the same way, the people at the lower levels condense and synthesise information so as to get maximum benefits for themselves. They hold back or ignore some important part of information. The more vertical levels in the organisation, the more chances are for filtering. This is a very frequently occurring communication problem.

Information Overload: Unchecked inflow of information very often becomes another barrier to communication. It may stifle the senior executive or bore and frustrate him. When people are bogged down with too much information they are likely to make errors. They may also delay processing or responding to information/message at least for some time. And delay may become a habit, causing serious communication problems. People may also become selective in their response, and selectivity is not communication-friendly. On the other hand it is a communication problem.

Poor Retention: Some people are also likely to forget messages reaching them, so there might be need to repeat the message and use more than one medium to communicate the same message.

Poor Listening: Poor listening may lead to serious communication problems. Too many people are interested in talking, and mostly talking about themselves. They are so much involved, with themselves that they do not have patience to listen. The result is that they are not interested in the speaker whose words go waste.

Everybody knows about the importance of listening, but very few actually practice patient, active and empathic listening. That is why so many communication problems crop up. Poor listening accounts for incomplete information and also poor retention. One may simply not get the desired result if this keeps on happening.

Goal Conflicts: Very often clashes of the goals of various units and sub-units of an organisation lead to communication breakdowns. Communication should serve as a conflict-reduction exercise. But the goal conflicts act as communication reduction mechanisms. Different units internalise their own goals, and that leads to the splitting or bifurcation of interests in the organisation. When people start competing for the fulfillment of their narrow interests communication suffers.
Offensive Style of Communication: It is quite obvious that offensive style of communication leads to communication breakdown. It is a rather sensitive point. way. Special care has to be taken that the intended message reaches the person concerned.

If a manager sends a message in such a way that the workers/ juniors become defensive their relations get strained and communication suffers. Hence it is absolutely necessary for the management to adopt a persuasive style of communication.

Insufficient Period for Adjustment: It is a well-known fact that people respond to change in different ways. They take their own time to adjust to any news or proposal for change. While the purpose of communication is to effect change it should be kept in mind that the employees whose duties, shifts, etc. are going to be changed should be given sufficient time. Only then the communication will be effective.

Loss by Transmission: Communication often suffers or gets diluted when messages pass on from person to person in a series of transmissions. They get diluted on the way. Special care has to be taken that the intended message reaches the person concerned.

Effective communication techniques [SAQ2]

Reading time: 2 Min

The following are some techniques that can ensure effective communication:

1. Using the right medium for the intended audience, the context and the desired response. For example when reporting to a boss, would you send a formal report or a text?

2. Consider receivers' emotions and motivations: The message can be a mix of factual and psychological aspects to give the message its full impact; rather than just dry facts or overly emotional in style

3. Use appropriate tone and language and ensure credibility: The language should be appropriate to the audience and communication medium. Avoid technical jargon unless talking to another professional. The language should also invite participation and engagement where appropriate

4. Pick the right person/stakeholder to send out the message – for example the chief executive will have more impact on trustees than a junior member of staff.

5. Keep it short and simple: the message must be clear, concise and complete. Be sure that the audience has the full message particularly as you may only have one opportunity to get across your message.

6. The message should be sent at the right time to enable the audience to have time to understand and act on the message.

7. Listen: Listening skills are just as important as communication skills in delivering one's message. This allows full understanding of the other party and what their response is to your point of view. Good listening is vital for building strong relationships. To be a good listener means to fully understand and constructively respond to what the other party is communicating. up.

Core listening skills

1. Giving the other party your full attention. If you are in their presence look at them directly, don't do other activities such as doodling. Try to understand their body language;

2. Encouraging them to speak. Ask open-ended questions;

3. Showing that you are genuinely listening by nodding, repeating back what they have said but in your own words;

4. Acknowledging their feelings e.g. saying 'It must have been really difficult for you when…'

5. Asking for clarification when you do not understand;

6. Not judging - trying to understand their point of view, rather than immediately applying your own preconceptions about the respondent;

7. Not interrupting - letting the other party put over their response fully before you react. Giving them time to express their point of view;

8. Being cautious in expressing your opinion. If it is clearly not appropriate don't express it;

9. Being timely in your reaction to the other party's responses to your messages - this is particularly true with communication that is not verbal.

Summary

This unit we have learnt the concept of noise and factors that hinder the communication process, they include: lack of planning, semantic problems, cultural barriers, wrong assumptions, socio-psychological barriers, emotions, selective perception, filtering, information overload, poor retention, poor listening, goal conflicts, offensive style of communication, insufficient period for adjustment, loss by transmission We have also been able to highlight some effective communication techniques like clarifying the purpose of the message; using intelligible encoding; consulting others' views; considering receivers' needs; using appropriate tone and language and ensuring credibility; getting feedback; considering receivers' emotions and motivations; and listening attentively.

Self-Assessment Questions

1. List and explain ten factors that constitute barriers to effective communication

2. State five effective communication techniques.

Tutor-Marked Assignment

1 Noise can come from the sender, the message or the receiver. True or False.

2. Poorly expressed message is an example of noise. True or False.

3. Clear assumptions are an example of noise. True or False.

4. How can cultural barrier be an obstacle in communication?

5. What is noise in communication?

6. Identify five ways of communicating effectively

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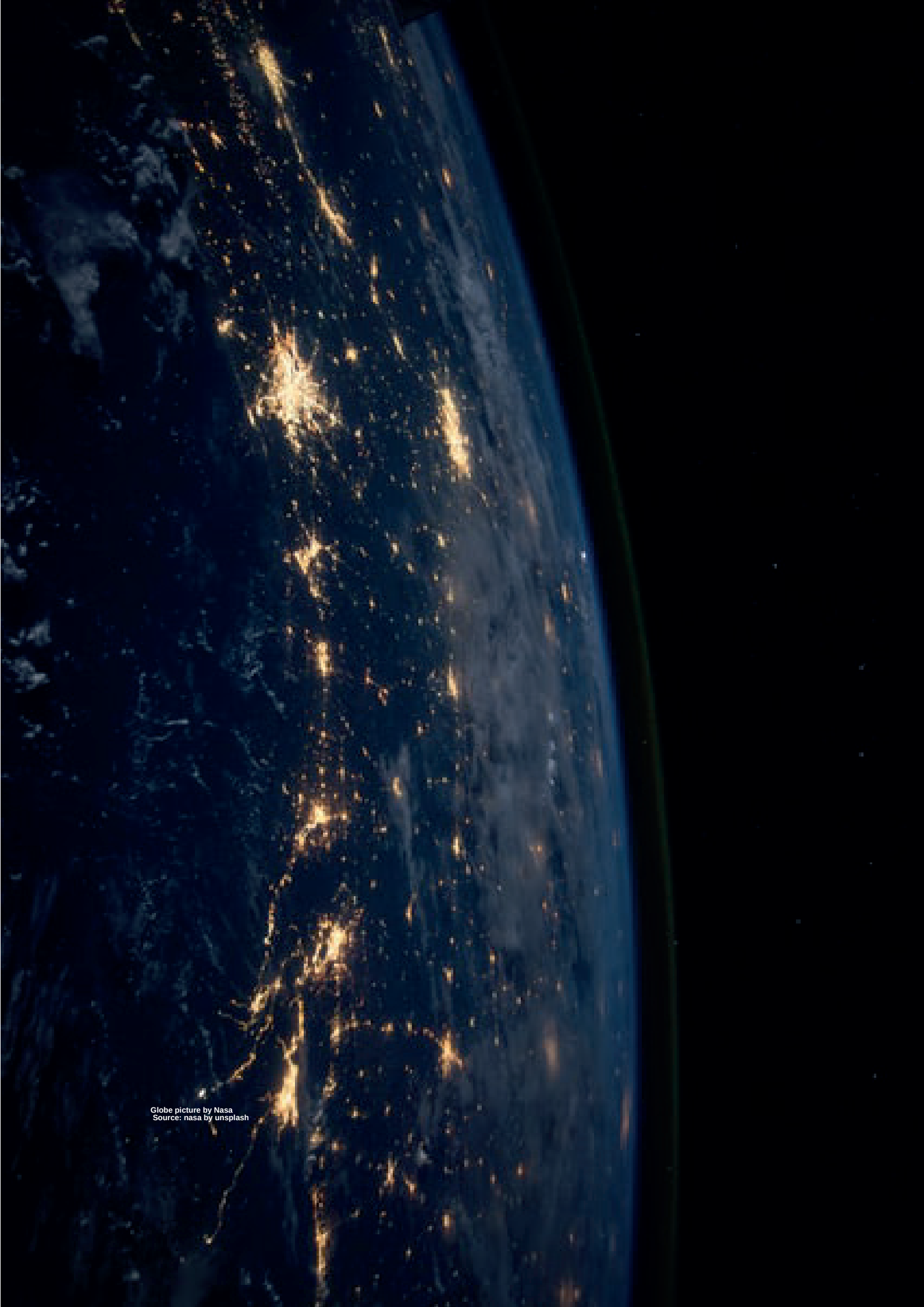


Globe picture by Nasa
Source: nasa by unsplash

MODULE 5

NEW TECHNOLOGIES AND ITS IMPACT

Units

Unit 1 Overview of the various technologies

Unit 2 Uses and Benefits of Information and Communication Technologies

Unit 3 Socio-economic, cultural, religious and environmental impact of information and communication technologies

Unit 4 Future trends of Information and Communication Technologies

Tec cube
Source: BCC

Unit 1

Overview of the various technologies

Introduction

In this unit, I will explain to you the concept of Information and communication technology (ICT) is an extended term for information technology (IT) which stresses the role of unified communications and the integration of telecommunications infrastructure (telephone lines, cable networks, wireless signals), computers and software. ICT enables users to access, store, transmit, and manipulate data. The term ICT is also used to refer to the convergence of audiovisual and telephone networks with computer networks through a single cabling or link system. This unit introduces ICT and its history.

Learning Outcomes

At the end of this unit, you should be able to:

- Distinguish between new and old technologies that make up ICTs.
- Explain the growth of mobile telephony
- Describe the convergence and integration of communication services.

imgix Server room
Souurce:unsplash by imgix

Main Content

OVERVIEW OF THE VARIOUS TECHNOLOGIES

Introduction to Information and Communication Technologies [SAQ1]

Reading time: 1 Min

Do you know ICT consists of all technical means used to handle information and aid communication, including both computer and network hardware as well as necessary software? In other words, ICT consists of IT as well as telephony, broadcast media, and all types of audio and video processing and transmission. These new information and communication technologies can be categorized in the following ways: Computer hardware and Software, transmission such as telephone, radio, TV, internet, cable, DSL, Satellite and broadband.

Historical Perspectives on Information and Communication Technologies [SAQ2&3]

Reading time: 6 Min

Telegraph and telephone

Do you know that the first commercial electrical telegraph was constructed in England by Sir Charles Wheatstone and Sir William Fothergill Cooke? It uses the deflection of needles to represent messages and started operating over twenty-one kilometres (thirteen miles). Both Wheatstone and Cooke viewed their device as “an improvement to the [existing] electromagnetic telegraph” not as a new device.

The first successful transatlantic telegraph cable was completed in 1866, allowing transatlantic telecommunication for the first time. Earlier transatlantic cables installed in 1857 and 1858 only operated for a few days or weeks before they failed. The international use of the telegraph has sometimes been dubbed the "Victorian Internet".

The conventional telephone was invented by Alexander Graham Bell in 1876, based on his earlier work with harmonic (multi-signal) telegraphs. The first commercial telephone services were set up in 1878 and 1879 on both sides of the Atlantic in the cities of New Haven and London. The technology grew quickly from this point, with inter-city lines being built and telephone exchanges in every major city of the United States by the mid-1880s.

In 1880, Bell and co-inventor Charles Sumner Tainter conducted the world's first wireless telephone call via modulated lightbeams projected by photophones. The scientific principles of their invention would not be utilized for several decades, when they were first deployed in military and fiber-optic communications.

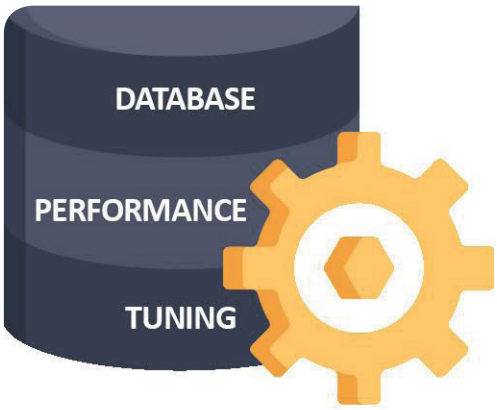
Radio and television

Do you know Nikola Tesla while Addressing the Franklin Institute in 1893, described and demonstrated in detail the principles of wireless telegraphy? The apparatus that he used contained all the elements that were incorporated into radio systems before the development of the vacuum tube. However it was not until 1900 that Reginald Fessenden was able to wirelessly transmit a human voice. In December 1901, Guglielmo Marconi established wireless communication between Britain and Newfoundland, earning him the Nobel Prize in physics in 1909 (which he shared with Karl Braun).

A RAdio Set
Source: Unsplash by Naadir Shahul

A Television Set
Source: Unsplash by Sven Scheuermeier

1925, Scottish inventor John Logie Baird publicly demonstrated the transmission of moving silhouette pictures at the London department store Selfridges. In 1925, Baird was successful in obtaining moving pictures with halftone shades, which were by most accounts the first true television pictures. This led to a public demonstration of the improved device in 1926 again at Selfridges. Baird's first devices relied upon the Nipkow disk and thus became known as the mechanical television. It formed the basis of semi-experimental broadcasts done by the British Broadcasting Corporation beginning in 1929.



John Logie Baird
Source:Encyclopedia, Britannica

However for most of the twentieth century televisions depended upon the cathode ray tube invented by Karl Braun. John Logie Baird switched from mechanical television and became a pioneer of colour television using cathode-ray tubes.

After mid-century the spread of coaxial cable and microwave radio relay allowed television networks to spread across even large countries.

Computer networks and the Internet

Do you know in 1940, George Stibitz was able to transmit problems using teletype to his Complex Number Calculator in New York and receive the computed results back at Dartmouth College in New Hampshire? This configuration of a centralized computer or mainframe with remote dumb terminals remained popular throughout the 1950s.

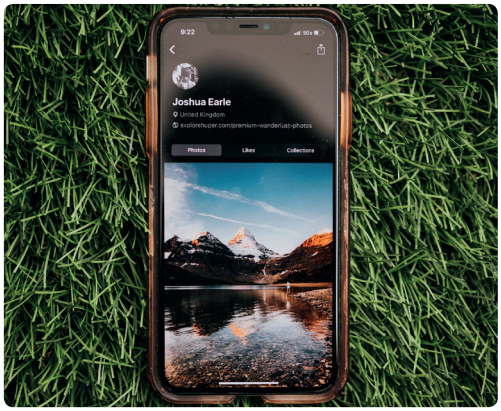
A Computer set
Source: Unsplash by Niclas Illg

However it was not until the 1960s that researchers started to investigate packet switching — a technology that would allow chunks of data to be sent to different computers without firstpassing through a centralized mainframe. A four-node network emerged in1969 and this network would become ARPANET, which by 1981 would consist of 213 nodes. Internet access became widespread late in the century, using the old telephone and television networks.

Mobile phones

Do you know the history of mobile phones begins with early efforts to develop mobile telephony concepts using two-way radios and continues through emergence of modern mobile phones and associated services?

However it was the 1940s onwards that saw the seeds of technological development which would eventually produce the mobile phone that we know today. Motorola developed a backpacked two-way radio, the Walkie-Talkie and a large hand-held two-way radio for the US military. This battery powered "Handie-Talkie" (HT) was about the size of a man's forearm.



An Iphone
Source: Unsplash by Pockey Lee

In 1946 in St. Louis, the Mobile Telephone Service was introduced. Only three radio channels were available, and call set-up required manual operation by a mobile operator.

The first fully automated mobile phone system for vehicles was launched in Sweden in 1960. Named MTA (Mobile Telephone system A), it allowed calls to be made and received in the car using a rotary dial. The car phone could also be paged. Calls from the car were direct dial, whereas incoming calls required an operator to determine which base station the phone was currently at.

First generation: Cellular networks

Do you know The technological development that distinguished the First Generation mobile phones from the previous generation was the use of multiple cell sites, and the ability to transfer calls from one site to the next as the user travelled between cells during a conversation?

The first commercially automated cellular network (the 1G generation) was launched in Japan by NTT in 1979.

Second generation: Digital networks

In the 1990s, the 'second generation' (2G) mobile phone systems emerged, primarily using the GSM standard. These differed from the previous generation by using digital instead of analog transmission. The rise in mobile phone usage as a result of 2G was explosive and this era also saw the advent of prepaid mobile phones

Coinciding with the introduction of 2G systems was a trend away from the larger "brick" phones toward tiny 100–200g hand-held devices. This change was possible not only through technological improvements such as more advanced batteries and more energy-efficient electronics, but also because of the higher density of cell sites to accommodate increasing usage. The latter meant that the average distance transmission from phone to the base station shortened, leading to increased battery life whilst on the move.

2G Mobile Devices
Source: bangokpost.com

2G also introduced the ability to access media content on mobile phones. In 1998 the first downloadable content sold to mobile phones was the ring tone, launched by Finland's Radiolinja (now Elisa). Advertising on the mobile phone first appeared in Finland when a free daily SMS news headline service was launched in 2000, sponsored by advertising.

Mobile payments were trailed in 1998 in Finland and Sweden where a mobile phone was used to pay for a Coca Cola vending machine and car parking. Commercial launches followed in 1999 in Norway. The first commercial payment system to mimic banks and credit cards was launched in the Philippines in 1999 simultaneously by mobile operators Globe and Smart.

The first full internet service on mobile phones was introduced by NTT DoCoMo in Japan in 1999.

Third generation: High speed IP data networks

As the use of 2G phones became more widespread and people began to utilize mobile phones in their daily lives, it became clear that demand for data services (such as access to the internet) was growing. Furthermore, experience from fixed broadband services showed there would also be an ever increasing demand for greater data speeds. The 2G technology was nowhere near up to the job, so the industry began to work on the next generation of technology known as 3G. The main technological difference that distinguishes 3G technology from 2G technology is the use of packet switching rather than circuit switching for data transmission.

During the development of 3G systems, 2.5G systems such as CDMA2000 1x and GPRS were developed as extensions to existing 2G networks. These provide some of the features of 3G without fulfilling the promised high data rates or full range of multimedia services. CDMA2000-1X delivers theoretical maximum data speeds of up to 307 kbit/s. Just beyond these is the EDGE system which in theory covers the requirements for 3G system, but is so narrowly above these that any practical system would be sure to fall short.

The high connection speeds of 3G technology enabled a transformation in the industry: for the first time, media streaming of radio (and even television) content to 3G handsets became possible, with companies such as RealNetworks and Disney among the early pioneers in this type of offering.

Growth of mobile broadband and the emergence of 4G

Although mobile phones had long had the ability to access data networks such as the Internet, it was not until the widespread availability of good quality 3G coverage in the mid 2000s that specialized devices appeared to access the mobile internet. The first such devices, known as “dongles”, plugged directly into a computer through the USB port. Another new class of device appeared subsequently, the so-called “compact wireless router” such as the Novatel MiFi, which makes 3G internet connectivity available to multiple computers simultaneously over Wi-Fi, rather than just to a single computer via a USB plug-in.

By 2009, it had become clear that, at some point, 3G networks would be overwhelmed by the growth of bandwidth-intensive applications like streaming media.[21] Consequently, the industry began looking to data-optimized 4th-generation technologies, with the promise of speed improvements up to 10-fold over existing 3G technologies. The first two commercially available technologies billed as 4G were the WiMAX standard (offered in the U.S. by Sprint) and the LTE standard, first offered in Scandinavia by TeliaSonera.

One of the main ways in which 4G differed technologically from 3G was in its elimination of circuit switching, instead employing an all-IP network. Thus, 4G ushered in a treatment of voice calls just like any other type ofstreaming audio media, utilizing packet switching over internet, LAN or WAN networks via VoIP.

TAKE OUT

Figure 5.1.1: 1G, 2G, 3G and 4G Technology (Source: Chinavasion, 2008)

Convergence and Integration

The convergence of communications services - voice, data, video and broadcast - via the same digital network holds great promise for the socio-economic development of the African continent. As technologies become digital, the transmission of hitherto different services (telephony, television, Internet) via the same digital network is creating convergence. Adapting to convergence is a condition for full and effective participation in the global economy and information society, a goal defined by the UN's World Summit on Information Society (WSIS) as "bridging the digital divide by 2015".

Summary

We have learnt how ICT consists of IT as well as telephony, broadcast media, and all types of audio and video processing and transmission. Old ICTs include radio, television, telegraphy, wired telephone, while new ICTs are mobile phone, Internet, satellite and broadband communication. Mobile telephony evolved with 1G (cellular networks), to 2G (digital networks), then 3G (high speed IP data networks) up to broadband and the emergence of 4G. we have also come to understand, that there is convergence and integration of communication services like data, voice, video and broadcast media via the same digital networks.

Self-Assessment Questions

1. Compare and contrast new and old technologies that make up ICTs.
2. Explain in detail the growth of mobile telephony.
3. Discuss the convergence and integration of communication services.

Tutor-Marked Assignment

1. The second-generation mobile phones is referred to as _____
2. One of the main ways in which 4G differed technologically from 3G was in its elimination of _____
3. Define ICT.
4. Differentiate between the 3G and the 4G systems.

5. What is convergence?
6. Describe the historical perspective of two early ICTs.

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ICT Initiatives
Source: www.afd.org, kigaly carnegie melon university

Unit 2

Uses and Benefits of Information and Communication Technologies

Introduction

In this unit will explain the meaning of ICTs as those technologies that can be used to interlink information technology devices such as personal computers with communication technologies such as telephones and their telecommunication networks. I will also look deep into the growth of information and communications technologies is transforming individual, economic and social development all over the world. Therefore, new information and communication tools are making people, industries, institutions and countries more productive in all aspects of their endeavors. The focus of this unit is to discuss the uses and benefits of ICTs.

Learning Outcomes

At the end of this unit, you should be able to:

- Discuss the uses of ICTs in all sectors of life.
- State and explain the benefits of ICTs.
- Explain how ICTs has benefited an individual.

earpiece
source: charles deluvio by unsplash

Main Content

USES AND BENEFITS OF INFORMATION AND COMMUNICATION TECHNOLOGIES

Uses of Information and Communication Technologies

Reading time: 8 Min

MOBILE PHONES

Do you know Mobile phones have already started functioning as more than just communications devices? Mobiles serve as watches and alarm clocks. Even with the limited free games that come with basic phones, they are already good for "time-pass". They can also function as calculators.

Digital camera: Point-and-click! Phones capture pictures and let us save them for posterity or transfer them to others and to computers.

Audio recorder: Mobile phones can be used to record conversations or even brief notes to oneself.

Video recorder: Phones are becoming video cameras also -- some of the newest cell phones can record an hour or more of video.

Multimedia messaging: Everything recorded can be shared with others by using MMS.

Email client: The phone can be used to connect to any POP or IMAP server and allow receiving and sending email. While most phones may not have the ease of use that a Blackberry has with email, contacts and calendar, the fact that it is on the phone itself and that there is no need for a separate device can be a big help (along with the lower total cost of ownership).

Web client: Phones can also browse websites, via a WAP and/or HTML browser. Most

web sites may not look great on the small screen, but it is still possible to connect to any web site.

Gaming platform: Mobile games have become big business in the past couple years as people seek entertainment in the free time that they have on the device that they always carry with them.

Documents viewer: It is increasingly possible to view documents on the cellphone, in the popular MS-Office file formats.

C**omputer adjunct**: For many, the cellphone has replaced the PDA as the complement to the computer. With a remote desktop application, it also becomes possible to make the mobile phone a window to one's computer.

Music player: The next big thing in 2005 is reckoned to be the combining of music capabilities on the mobile phone. While phones can play MP3s, it will soon also be possible to have music streamed from the Internet. Motorola is expected to introduce a phone this year that marries the mobile with Apple's iPod.

TV: In India, some operators have been promoting many TV channels on the cellphone over next-generation networks like EDGE.

Wallet: The phone can also be used to pay for purchases like a credit or debit card. There is already a billing relationship that exists between the subscriber and the operator, and that can be used to make payments to merchants.

THE INTERNET

The Internet is allowing greater flexibility in working hours and location, especially with the spread of unmetered high-speed connections and web applications.

Publicity, marketing and advertising on popular web pages can be lucrative, and e-commerce or the sale of products and services directly via the Web continues to grow.

Communication: Internet also gives us the prospective to communicate effectively and efficiently. E-mail is an important communications service available on the Internet. The concept of sending electronic text messages between parties in a way analogous to mailing letters or memos predates the creation of the Internet. Internet telephony is another common communications service made possible by the creation of the Internet.

Data transfer: File sharing is an example of transferring large amounts of data across the Internet. A computer file can be e-mailed to customers, colleagues and friends as an attachment. It can be uploaded to a website or FTP server for easy download by others.

Internet shopping has also become popular amongst users especially in developed nations; this is because 'shop on internet' is more efficient than physically going into the stores.

Webcams can be seen as an even lower-budget extension of this phenomenon. While some webcams can give full-frame-rate video, the picture is usually either small or updates slowly. Internet users can watch animals around an African waterhole, ships in the Panama Canal, traffic at a local roundabout or monitor their own premises, live and in real time.

Others include: networking, research, training and continuing education, collaboration, direct online selling etc.

COMPUTERS

Do you know Computers have leapfrogged the human society into another league? It is used in each and every aspect of human life. They will spearhead the human quest of eradicating social problems like illiteracy and poverty. It is difficult to imagine a world bereft of computers. This revolutionary technology is indeed a boon to the human race. Some of the uses of computers include:

Word Processing - Word Processing software automatically corrects spelling and grammar mistakes. If the content of a document repeats you don't have to type it each time. You can use the copy and paste features. You can printout documents and make several copies. It is easier to read a word-processed document than a handwritten one. You can add images to your document.

Internet - It is a network of almost all the computers in the world. You can browse through much more information than you could do in a library. That is because computers can store enormous amounts of information. You also have very fast and convenient access to information. Through E-Mail you can communicate with a person sitting thousands of miles away in seconds. There is chat software that enables one to chat with another person on a real-time basis. Video conferencing tools are becoming readily available to the common man.

Digital video or audio composition – Audio or video composition and editing have been made much easier by computers. It no longer costs thousands of dollars of equipment to compose music or make a film. Graphics engineers can use computers to generate short or full-length films or even to create three-dimensional models. Anybody owning a computer can now enter the field of media production. Special effects in science fiction and action movies are created using computers.

Desktop publishing - With desktop publishing, you can create page layouts for entire books on your personal computer.

Computers in Medicine - You can diagnose diseases. You can learn the cures. Software is used in magnetic resonance imaging to examine the internal organs of the human body. Software is used for performing surgery. Computers are used to store patient data.

Mathematical Calculations - Thanks to computers, which have computing speeds of over a million calculations per second we can perform the biggest of mathematical calculations.

TELEVISION

Television has a number of uses. First of all, it makes it possible for us to see what is happening far away. Television is a very fine medium of entertainment. It brings musician and the music, singer and his singing and actor and his acting close to us. Television can be used to teach uneducated people. Through it we can improve knowledge of our students and educated people. Political television programmes are of great importance, they bring political leaders and their views close to people.

Benefits of Information and Communication Technologies

In the education sector, positive effect associated with technology aided instruction programs are: Computer Assisted Learning (CAL) or Computer Assisted Instruction (CAI), Computer Assisted Design (CAD), and Computer Managed Instruction (CMI). The use of ICTs in education has changed what is learnt and how learning takes place. Some advantages of ICTs in education are: ICTs

• Provide access to worldwide information resources.

• Provide (via the internet) teachers and students with a platform through which they can communicate with colleagues from distant places, exchange work, develop research, and function as if there were no geographical barriers.

• Provides opportunities for students to practice basic skills in their own time and at their work.
• Motivate and engage students in the learning process.
• Allow material to be presented in multiple media for multi-channel learning.
• Bring abstract concepts to life.
• Allow students to use the information acquired to solve problems, formulate new problems and explain the world around them.
• Provide most cost effective means for bringing the world into the classroom.

In the health sector

Email has facilitated the unprecedented collection and exchange of information; infrastructure investment has improved electronic accessibility in many regions; website development has resulted in an explosion of online publishing by many organizations; reproductive health curricula, on CD-ROMs and websites, have greatly enhanced health worker training programs; and satellite technology has expanded the potential of radio broadcasting. The development of "open source" software for knowledge sharing within organizations and communities of practice promotes peer review, shared use of data and statistics, and the capture, distillation, synthesis, and dissemination of lessons learned.

Older ICTs are being used in new ways: telephone hotlines are becoming an increasingly important tool to provide sensitive information and counseling to individuals; print newsletters are also published on the web and disseminated by email. HIV prevention programs that target youth through TV, radio, and websites reach millions of youth simultaneously and provide channels for social action. However, significant financial, political, cultural, and technological obstacles affect the establishment of sustainable programs in low-resource settings (RHO survey result 2003).

ICT applications also support efficient exchange of information between health professionals, they enable transfer of patient records between sites and they can improve clinical effectiveness, continuity, and quality of care by health professionals (Mansell and Wehn 1998). ICT applications facilitate telemedicine - "the use of ICTs to provide medical demand independent of person-to-person contact" (Mansell and When, 1998). Telemedicine provides medical service to people in geographically

diverse settings: at home and in isolated places or in emergencies.

In the economic sector, websites have given businesses the:

• Ability to open for 24 hours a day with no labour costs to watch it: An online store never closes and a website faces no time zone barriers.

• Ability to reach new markets with a Global audience: A website will broaden one's base of customers, members, distributors or suppliers. More clients can be generated for business without doing additional marketing.

• Ability to present a professional and credible image: Today, customers, employees, and suppliers expect to be able to find and communicate with a business online. Firms that still do not have a web presence are inadvertently making a statement about their ability to embrace technology and adapt to change in today's dynamic environment.

• Improved Customer Service: One can provide 24 hours customer services without hiring any additional employees. Customers are better served when they can access information about products or services immediately via websites rather than waiting for a mailed brochure or a return telephone call. Furthermore, information requests can be processed immediately via online forms and auto responders whether someone is in the office or not.

• Ability to save money on printing and distribution costs: A website is an online brochure or catalogue that can be changed or updated at anytime at a much cheaper and faster rate than print material. It saves money on printing and distribution costs.

• Creation of product or service showcase: A website can provide photos and detailed descriptions of products and services. It can also show how products or services can help customers in their personal or professional lives.

• Automation, productivity and profitability: Online automation can reduce costs for advertising, sales personnel, and other support staff. A website increases a company's productivity because less time is spent explaining product or service details to customers since such information would be available 24 hours a day on the website. A website also saves costs by allowing users to download invoices, proposals, and other important documents.

• Sales of products and services online: Selling through a website is much cheaper and a great way to supplement offline business. Providing secure online ordering is very affordable today. That explains why the worldwide online commerce has reached $6.8 trillion by 2004.

• Stability: A place of business could be moved, phone numbers could be changed or even opening hours, but website addresses never changes, and a website is always open.

• Ability to own an internet identity: A company's own domain name (www.yourcompany.com) establishes a strong online brand identity, and allows one to set up email addresses specific to ones own company. Today, email is the most common way to communicate efficiently and professionally with the rest of the world.

• Promotion of services: Lawyers, doctors, financial consultants, entertainers, realtors and all service oriented businesses takes advantage of the massive reach of the Internet. Millions of users are ogging on to the Web to compare various specialists and practitioners before they purchase a specialized service.

• Customer feedback: One can gather information about existing and potential customers by using online forms and surveys. A feedback form can be provided to make it easy for customers to send their input.

• Worldwide exposure: One can register a website with various search engines and directories that reach more than 800 million Internet users around the world. Most of the search engines and directories allow free registration of websites. Leverage the massive reach of the Internet and the precision targeting of the search engines and directories.

• Tool for Recruiting: Jobs can be posted concerning the opportunities with your company on your website. A website is a great recruiting tool for building your business.

• Ability to transfer information to branches and affiliates: Transfer of documents through a website is cheaper and faster than by UPS, FedEx, etc. Files can be protected with the use of password if security is needed.

• Viral marketing without a marketing cost: Satisfied customers can refer a company to their friends and relatives through an online form on the company's website.

• Ability to improve advertising effectiveness: A website address on all of a company's promotion will give the company a cutting edge corporate image and it will encourage the viewers to check the site for additional information. The addition of the website address on adverts increases exposure without adding any cost.

• Ability to educate customers: A website can offer free advice about services and products including ideas and suggestions for maximizing the benefit of the products.

ICTs have increased international interconnectedness and sped up the process of globalization. They have been instrumental in the information revolution, facilitating the transition from industrial economies, driven by the manufacturing sector, to knowledge economies.

ICTs, in conjunction with globalization and the information revolution, have reshaped the workforce. By increasing the speed of international communication. ICTs have enabled corporations to outsource jobs, both in the manufacturing as well as white collar'' sectors.

All financial transactions are done by computer software. They provide security, speed and convenience. The computer software authenticates the user and dispenses cash.

Job creation for (recharge card sellers, mobile phone repairers, hardware vendors, café owners, workers in the telecommunication sector).

Summary

We have learnt that ICTs have numerous uses and benefits in the health, education, economic, agricultural, political and other sectors of life. Mobile phones are used for communication, electronic transactions, recorders, e-learning, other internet enabled services, entertainment, among others. Computers are used for instructional learning, word processing, desktop publishing, e-business, and so much more. Benefits of ICTs in medicine include: telemedicine, ERMs, electronic transfer of patients record, etc. in the economic sector, ICTs have made e-business and e-commerce feasible, e-payments, automation of business processes, better client-customer relationship, etc. E-learning, learning through multimedia, use of instructional packages, computer assisted learning, collaboration, research and dissemination of findings are some of the benefits of ICTs in the educational sector.

Self-Assessment Questions

1.Discuss the uses of ICTs in all sectors of life.

2.State and explain five benefits of ICTs to the educational sector.

3.Discuss the benefits of ICTs in the medical sector.

4. Explain how ICTs have benefited you as an individual.

Tutor-Marked Assignment

1. State ten uses of mobile phones.
2. What are the benefits of ICTs in the education sector?
3. Explain how the health sector has benefited from new ICTs.
4. Discuss the role of the Internet in the business sector.
5. What is the full meaning of ICT?
6. Internet gives us the prospective to communicate effectively and efficiently. True or False.
7. How can ICTs be used to improve health delivery in Nigeria?

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man checking statistics
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Unit 3

SOCIO-ECONOMIC, CULTURAL, ENVIRONMENTAL AND RELIGIOUS IMPACT OF INFORMATION AND COMMUNICATION TECHNOLOGIES

Introduction

In this unit I explain how Information and Communication Technologies (ICTs) has taken the center stage in almost every aspect of human endeavor. ICT has helped companies and institutions to improve the efficiency and effectiveness of services offered to customers, and thus enhances business processes, managerial decision making, and workgroup collaborations, thus strengthening their competitive positions in rapidly changing and emerging economies.

Learning Outcomes

After completing this unit, you should be able to:

- Evaluate the challenges ICTs as brought to different sectors of the economy.
- Discuss how the challenges that has emanated from the use of ICTs can be overcome.
- Appraise the impact of ICTs in different sectors and to them as individuals.

technology
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Main Content

SOCIO-ECONOMIC, CULTURAL, RELIGIOUS AND ENVIRONMENTAL IMPACT OF INFORMATION AND COMMUNICATION TECHNOLOGIES

Socio-Economic Impact of ICTs [SAQ1]

Reading time: 6 Min

Do you know the Internet has enabled entirely new forms of social interaction, activities, and organizing, thanks to its basic features such as widespread usability and access? Social networking websites such as Facebook, Twitter and MySpace have created new ways to socialize and interact. Users of these sites are able to add a wide variety of information to pages, to pursue common interests, and to connect with others. It is also possible to find existing acquaintances, to allow communication among existing groups of people. Sites like LinkedIn foster commercial and business connections. YouTube and Flickr specialize in users' videos and photographs.

Digital video or audio composition – Audio or video composition and editing have been made much easier by computers. It no longer costs thousands of dollars of equipment to compose music or make a film. Graphics engineers can use computers to generate short or full-length films or even to create three-dimensional models. Anybody owning a computer can now enter the field of media production. Special effects in science fiction and action movies are created using computers.

Desktop publishing - With desktop publishing, you can create page layouts for entire books on your personal computer.

Many people use the World Wide Web to access news, weather and sports reports, to plan and book vacations and to find out more about their interests. People use chat, messaging and e-mail to make and stay in touch with friends worldwide, sometimes in the same way as some previously had pen pals. The Internet has seen a growing number of Web desktops, where users can access their files and settings via the Internet. e-card and other virtual gift can be sent to friends and loved ones.

You will observe that the impact that mobile technologies deliver is far-reaching. The mobile platform offers greater functionality and natural reach than any preceding technology. From real-time and accurate-location information to uninterrupted, in-movement consumption of multimedia, mobile will change how personal and information technology decisions are made by individuals and businesses.

You will also notice that Mobile phones are not the bricks that they were a few decades ago. Today's mobile phones are small enough to slip in to your pocket but also powerful enough to surf the internet, send emails and even make video calls. There are many different mobile phone manufacturers. Some of the biggest include; Nokia, Sony and Motorola Mobile communications is a powerful catalyst for personal, national and regional development that does not depend upon political systems. Mobile eliminates many social, cultural, educational and economic barriers. People of the Middle East and Africa no longer need to walk to the next village to speak with friends and relatives or do business. With borderless mobile communications, families divided by wars, and workers in distant countries can keep in touch or even pay bills, and economies in remote regions can grow.

The growth in mobile phone usage has been astonishing. In Africa, the impact has been even more staggering; the density of mobile phones outstripped that of landlines and completely changed the continent's economic outlook. The increase and diversification of mobile phone-based services is further increasing empowerment of all people, women and men alike. Mobile banking is a prime example of a service that expands the impact of mobile communications.

Mobile banking is a convenience for consumers in highly banked, developed countries. oves the people's economic lives.

Do you know Economist Jeffrey Sachs has championed mobile telephony as 'the single most transformative technology for development'? A seminal study also concluded that mobile telephony has a 'positive and significant impact on economic growth' and the benefits in developing countries may be twice as large as in richer economies. The results showed that a developing country with an average of 10 more mobile phones per 100 population has 0.59 percent higher GDP growth than an otherwise identical country. Mobile telephony is seen as a way of leapfrogging the conventional development process as it bypasses the more extensive and expensive infrastructure needed to establish fixed-line phones.

The benefits of mobile phones have been broadly grouped into three categories: incremental (improving the speed and efficiency of what people already do), transformational (offering something new), and related to production (selling mobiles and related services). Small business users make incremental gains as mobiles enable customer calls to be answered immediately, including away from the office, and such prompt replies could make the difference between receiving or losing an order. Such instant communication may provide an opportunity to address 'informational challenges', such as 'absence, uncertainty, asymmetry', which dictate the efficiency of markets. In the case of the cloth-weaving sector in Nigeria and the informal construction sector in Dar es Salaam, mobile telephones have reduced costs and saved time, largely by avoiding the need to travel for business transactions.

The transformational benefits of mobile telephony also operate outside economics, particularly within the health sector. Mobile phones are now used as tools to collect health data, support diagnosis and treatment, and disseminate health education in poor settings, creating new mobile diagnostics, improving the collection of public health data, and persuading people to adopt healthier behaviors (Kalil, 2008). Examples include daily text message medication reminders sent to tuberculosis patients, and Uganda's Text to Change project, which raises HIV/AIDS awareness via a text message-based quiz.

Access to mobile phones has also been credited with preventing women dying in childbirth in Amensie, in south-central Ghana, as villagers can now call the ambulance when it is needed. Another example from Ghana demonstrates the diversity of mobile health (mHealth) initiatives. The start-up company mPedigree has developed a service in the country which enables consumers to check whether pharmaceuticals are counterfeit. A code displayed on the medication is sent via text message to mPedigree and the consumer receives a text almost instantly to say if the product is genuine.

Another way it has improved global health outcomes is the development of an attachment for cell phones that can take high-resolution images of blood smears, infected skin, or crop blight, and transmit the images to experts anywhere in the world.

The accessibility and functionality of mobile phones have also enabled them to be used in innovative ways across a spectrum of other fields, including veterinary medicine, politics, and the environment. For instance, students at the Royal Veterinary College, part of the University of London, used mobile phones for data collection regarding the health of cattle in Zanzibar in 2009. Using a multiple choice form (developed on the Google Android platform) on their mobile phones, the students entered details about the animals they examined, specifically to track the spread of East Coast Fever. This approach has many advantages: the data can easily be captured, stored, shared between vets, and uploaded to a central database. The system avoids the inefficiencies, delay, and inaccuracies often associated with transferring handwritten records to a central system.

Mobile technology is also being used to strengthen democratic institutions and for political applications as a means to improve transparency and accountability. During the Nigerian elections in 2007 volunteers sent their observations about the poll via text message to a central database, and these reports were then relayed to other monitoring groups, including the EU. Such two-way communication was powered by FrontlineSMS – free and versatile software that enables users to communicate via text message with large groups of people wherever there is a mobile signal (importantly, internet access is not required).

There are a growing number of examples of mobile communications being used to topple governments (2001, Philippine President Joseph Estrada was driven from office by hundreds of thousands of angry citizens mobilized by millions of text messages and e-petitions), improve election monitoring, report on human rights abuses, strengthen civil society, and democratize the flow of information.

The growth of the mobile sector has also generated production-related benefits within the formal and informal sectors. The large telecommunications companies – part of the formal sector – provide jobs, and generate substantial tax revenues for the countries where they operate. (The amount of tax levied per mobile phone user has been criticized as 'disproportionately high in many developing countries', ranging from an annual average of US$24 to US$179 in 16 of the most heavily taxed countries). Meanwhile, entrepreneurs, often in the informal sector, are adopting imaginative ways to benefit from the popularity of mobile phones.

They are selling airtime, ringtones and phone covers, and providing 'mobile' mobile services by travelling to their customers by bike with phones and spare batteries.

Cultural, Religious and Environmental Impact of ICTs

Cultures continuously change, to some extent, in the dynamic interaction between individuals and their environment. Research has shown that information and communication technology (ICT) usage play specific roles as an instigator of cultural change. ICTs enable data access from anywhere which has led to the uplift of the level of education and awareness for many people especially in rural areas. It can also help propagate instant messaging which increases people's awareness and ensure their inclusion in the happenings around them. In addition, ICTs has turned the whole word into a global village, which means that whatever is trending (fashion, movies, music, etc.) in America or Asia is at the same time available in Africa, all these facts is bound to affect the cultures around the globe.

We have been established that technology in whatever form somehow relates to religion, positively, negatively, or neutrally, since religion is also supremely a matter of values. Information Technology enhances religious practices by facilitating the creation and expansion of religious communities.

Personal computers are often used for sermon preparation and personal religious study, while network have been instrumental in communications. There are thousands of mobile applications that have been developed to remind worshippers to pray at the correct time, to access Qur'an and Bible quotes, memorize the scriptures, etc. Many Mosques and churches have also created websites to serve current members and also reach out to prospective ones. A website is useful in providing religious institutions with online presence and serves like advertisement of the institution on the internet where anything about the religious institution can be known to visitors to the site. Religious scholars can also use the websites to provide visual sermons online, admonish and train people. Other forms of ICTs that are useful in promoting and delivering religious messages include CDs, DVDs, Social media platforms, etc.

ICT has both positive and negative impacts on the environment. Positive impacts can come from: dematerialization and online delivery; a reduction in the need for travel; a host of modeling, monitoring and management applications; and greater energy efficiency in production and use, and recycling. For example, scientific satellites orbit the Earth looking down and measuring all kinds of things, such as the: state of the polar ice over time, flow of ocean currents, changing temperatures of the oceans, alarming growth of deserts, the burning of primary jungles such as the Amazon, hole in the ozone layer each season, state of crops and greenery around the planet.

While negative impacts can come from: the production and distribution of ICT equipment; energy consumption in use (directly and for cooling); short product life-cycles and e-waste; and potentially exploitative applications.

For example, electronic waste or e-waste has become a huge problem around the world, as much of it used end up in landfill. The major problem with e-waste is that the toxic chemicals such as lead, arsenic and cadmium can leach into the soil over time and contaminate the water. As a result most countries in the developed world have introduced regulations to prevent e-waste being dumped into landfill. The majority of components in electronic goods now have to be recycled.

Information and communication technologies also have direct and indirect effects on the environment.

Direct environmental effects of ICT include the resources used and emissions that are caused by the production, use, and disposal of ICT hardware. Indirect environmental effects are ICT-induced changes in patterns of consumption and production also in domains other than ICT and the environmental implications of these changes.

Challenges of Information and Communication TechnologieS [SAQ2]

Reading time: 2 Min

Many negative consequences has emanated from the emergence of ICTs, they include but not limited to:

Internet addiction disorder is excessive computer use that interferes with daily life. Some psychologists believe that Internet use has other effects on individuals for instance interfering with the deep thinking that leads to true creativity.

Internet Fraud is a term used to describe a cybercrime that intends to deceive a person in order to gain important data or information. Fraud can be done by altering, destroying, stealing, or suppressing any information to secure unlawful or unfair gain.

Social engineering is a method in which cybercriminals make a direct contact with you through phone calls, emails, or even in person. Basically, they will also act like a legitimate company as well. They will befriend you to earn your trust until you will provide your important information and personal data.

The internet is filled with torrents and other programs that illegally duplicate original content, including songs, books, movies, albums, and software. This is a crime as it translates to copyright infringement. Due to software piracy, companies and developers encounter huge cut down in their income because their products are illegally reproduced.

Health hazards associated with the use of mobile phones and computers include repetitive stress injury, eye irritation and eye fatigue, lower back pain etc. Other long term injuries are headaches and tiredness, joint pains, and induced ringing in the ear.

They attempt to break into network systems purely to alert the owners of flaws. It's not always altruistic, though, because many do this for fame as well, in order to land jobs with top companies, or just to be termed as security experts. "Grey Hat" is another term used to refer to hacking activities that are a cross between black and white hacking.

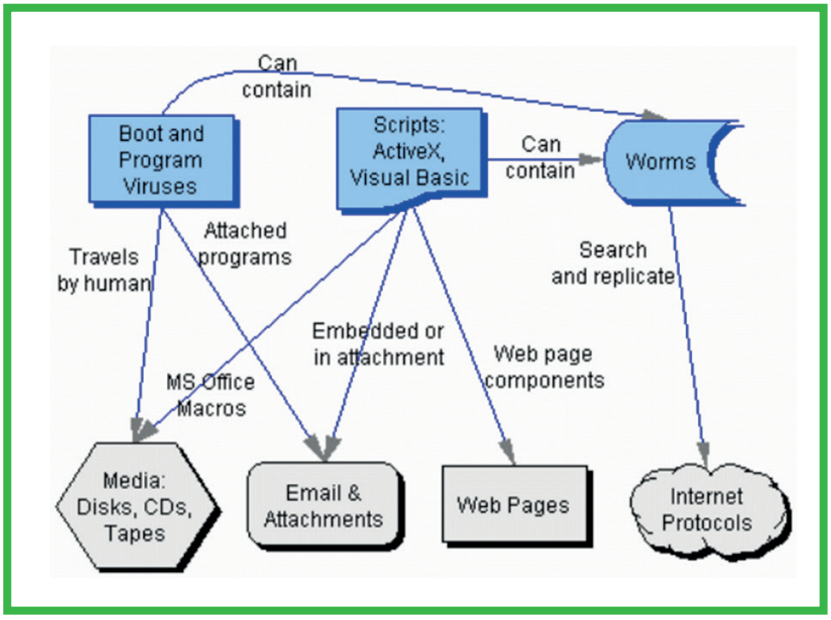
Theft of FTP Passwords is a very common way to tamper with web sites. FTP password hacking takes advantage of the fact that many webmasters store their website login information on their poorly protected PCs. The thief searches the victim's system for FTP login details, and then relays them to his own remote computer. He then logs into the web site via the remote computer and modifies the web pages as he or she pleases.

Identity theft is where a person gathers your personal information and poses as you to get credit, merchandise, services, or to use the identity to commit other crimes. They obtain this personal information by phishing, database cracking, or survey.

Spyware is software that is downloaded onto a user's computer without his knowledge and used for malevolent purposes. It can be downloaded simply by going to a website (called Drive-by Downloads), or it can be downloaded unknowingly while installing another program. Spyware can crash computers, slow performance, track emails and visited websites, and track keystrokes that capture the user's personal information.

Malware is the malicious software that is developed for the purpose of doing harm. Malware examples are Computer Viruses, Worms, and Trojan horses. A Worm is a self-replicating virus that continues to duplicate itself taking up memory and resources. A Trojan horse is a hidden program that later gains control and causes damage to your computer.

A laptop with Virus
Source: Unsplash by Michael Geiger



TAKE NOTE

Figure 5.3.1: How Malware can Propagate (Source: Elnaim, 2013)

Cyberstalking is a crime where the attacker harasses the victim using electronic communication such as email, IM's, chat rooms, discussion groups. Cyberstalkers rely on the anonymity of the Internet thinking they cannot be caught. Cyberbullying is one of the most rampant crimes committed in the virtual world. It is a form of bullying carried over to the internet. On the other hand, global leaders are aware of this crime and pass laws and acts that prohibit the proliferation of cyberbullying.

Summary

We have learnt that ICTs have impacted our lives in different way that was never imagined, socially, economically, religiously, culturally etc. The benefits of mobile phones have been broadly grouped into three categories: incremental, transformational and related to production. Social networking websites such as Facebook, Twitter and MySpace have created new ways to socialize and interact thanks to the Internet. Despite all these, there are challenges that are associated with the use of ICTs which include internet addiction, cybercrime, pornography, hacking, health hazards, etc.

Self Assessment Questions

1. List and explain six challenges of ICTs.
2. How can the challenges that has emanated from the use of ICTs be overcome?
3. How has ICTs impacted on you as a student?

Tutor-Marked Assignment

1. _____ is an example of health hazards associated with the use of mobile phones.
2. The Internet has enabled entirely new forms of social interaction. True or False.
3. Compare and contrast the positive and negative impacts of ICTs
4. How have ICTs impacted on you as an individual?
5. Argue for or against parents allowing their wards to have access to the Internet.

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code data
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Unit 4

FUTURE TRENDS OF INFORMATION AND COMMUNICATION TECHNOLOGIES

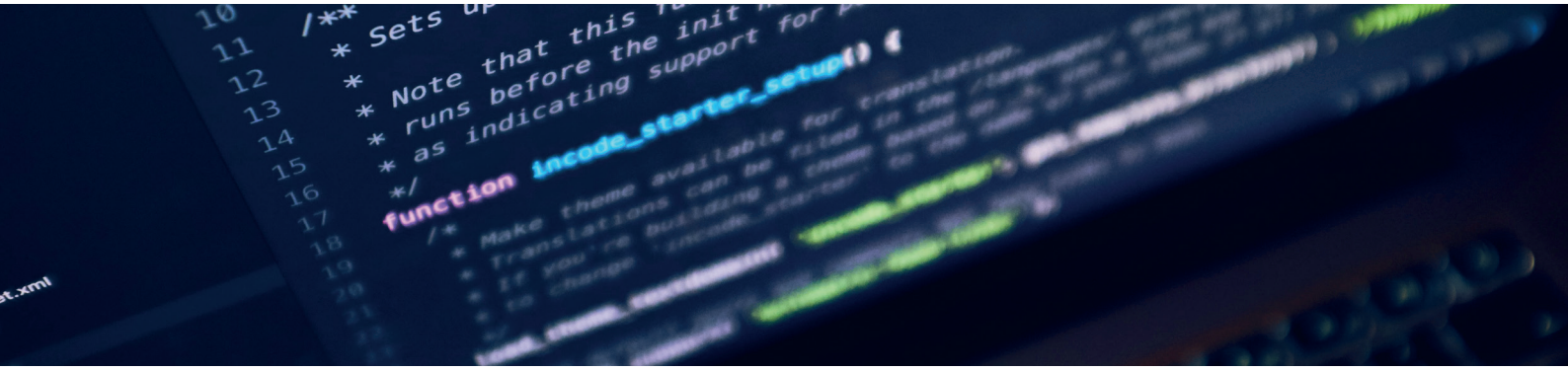
Introduction

Industrial Revolution, is creating new opportunities and challenges for society (Amazon's postal delivery drones, Google's self-driving cars, genetically modified food and artificial intelligence). Information and Communication Technologies will continue to revolutionalise industries as more and more sophisticated technologies evolve, hence this unit describes the future trends of ICTs.

Learning Outcomes

Before the end of this study unit, you should be able to:

- Demonstrate an understanding of things ICTs can achieve in the future
- Explain how ICTs have revolutionalised industries.



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Main Content

FUTURE TRENDS OF INFORMATION AND COMMUNICATION TECHNOLOGIES

Future trend of ICTs [SAQ1,2&3]

Reading time: 10 Min

Do you know that Emerging technologies such as nanotechnology, biotechnology, personalized medicine, synthetic biology, applied neuroscience, geo-engineering, social media, surveillance technologies, regenerative medicine, robotics and artificial intelligence present complex governance and oversight challenges? These technologies are characterized by a rapid pace of development, a multitude of applications, manifestations and actors, pervasive uncertainties about risks, benefits and future directions, and demands for oversight ranging from potential health and environmental risks to broader social and ethical concerns. Given this complexity, no single regulatory agency, or even group of agencies, can regulate any of these emerging technologies effectively and comprehensively. For example, the sale and widespread use of both semi–autonomous and fully autonomous vehicles, also known as 'driverless cars,' are both imminent and likely to significantly change the way in which citizens commute, interact, and travel.

But current rules in many jurisdictions do not allow self–driving cars on the roads. Making this change is relatively simple. However, there are many other more complex regulatory issues that will need to be addressed.

The driverless car will generate an enormous amount of data for possible alternative usage, which is likely to create new issues related to data security and privacy concerns. Driverless cars will need to communicate both among themselves and with the transport infrastructure to be most effective in their operation. To facilitate this, regulators will need to safeguard telecommunication frequencies and protect against security threats, most obviously the possibility of "car–hacking. Evolving trends in the ICT world generally include:

Haptic Technology: It is also known as "Feedback Technology" which fundamentally uses Computer Applications. When users touch the device, this "touching" applies some force, so the device senses the users' touch. It can also sense other forces like vibrations etc. This technology is mostly used in Game Controllers & Joysticks and it is also becoming more popular in smart phones. Haptic technology is being applied to Movies, Games and other numerous multimedia technologies. Imagine that your operation is in Islamabad and your doctor lives in Washington DC, so he will operate on you in Islamabad from his computer in Washington DC or imagine that you're interacting with a hologram or through the internet, you are 'Touching' and 'Examining' the texture/surface of the trouser to decide whether you are going to buy it or not. This technology can yield much more advances in our daily life because it has considerable potential to do so.

Contextual Awareness: The future devices will be able to learn about you e.g. Who you are? Where you live? or where you work? and even 'how' you work? by combining your hard information such as where you are as well as what are the conditions around you with soft information such as your social network, your past preferences & your calendar. Additionally, such devices can predict your needs as they are constantly learning about your life and way of living. Let's imagine that your Personal Computer is advising and counseling you for different tasks like to reach the meeting at a specific time, or it is telling you that how much time is left for you to have the dinner, or suggesting you to take a different route because the route which you were going to take is blocked.

A future where your remote control exactly knows what your favorite channels are and whenever you hold it in hand, it automatically selects those channels for you!

Voice & Tone Recognition: Imagine that you are going to enter in your room, and say "Open the door !". The door opens automatically. Or whenever you want to turn the lights off, you say "Lights off !", and the lights get turned off automatically. Any person's identity can be confirmed by using Voice & Tone Recognition features. Likewise, it can be used to detect one's emotional state as well as health state. New opportunities in security and health care with mobile applications can be opened with the help of this invention, like your mobile phone gets unlocked only when you ask it to do so.

Intelligent Routing to Devices: Local counsels can be privileged and advantaged by this technology. While on the move, precise location and description of a street-based issue will be provided by the staff using mobile devices & smart phones with GPS (Global Positioning System) support. The devices will capture snaps and run artificial intelligence algorithms. The intelligent routing will alert the responsible staff to action. This invention can also help people when they are in journeys as it can guide them and can tell them about the most suitable routes precisely.

Gamification: One can see that the use of gaming amongst kids and youngsters is very common and is increasing every day. But now this technology can be applied to the non-gaming apps in such a way so that they become more appealing. It is one of the most vital trends which have been proved by many industry experts. This technique can be applied in any field and almost anything in order to promote enjoyment and winsome experiences by adding attractive features in them. Gamification is changing the approach of doing business as well. It affects moods positively and strengthens the commitment and friendly relation between customers and employees to the levels which have never seen before !

Eye Tracking Technology: Devices having this technology measure the movements and positions of the human eyeballs and analyze them by using computer apps. For example, when you are trying to look somewhere very carefully, the device senses your gaze and zoom the view so that it makes easy for you to see. Gaze monitoring is also being used in modern vehicles to watch the drivers in a way that whether they are actively looking on the front while driving or not.

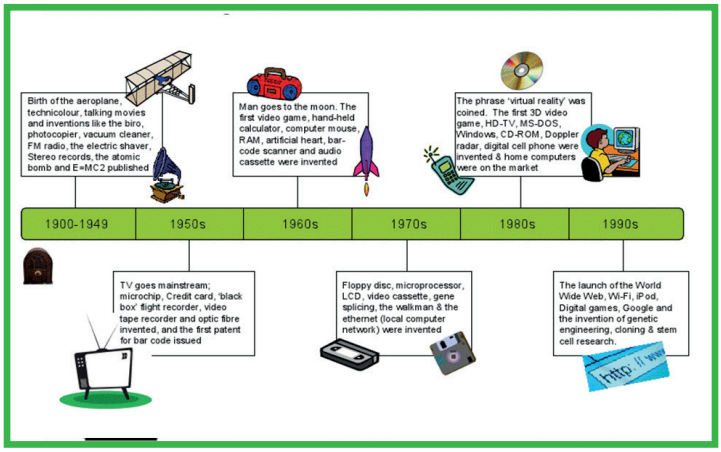
Eye Tracking is one of the most important technologies and it has many applications like:

1. Law Enforcement: Detection of lies.
2. Health Care: Using electrical wheelchairs, monitors, and laptops etc. to can help the persons who are paralyzed (mentally or physically).
3. Safety: Alerting the drivers when they are not paying attention at the front while driving or when they get distracted.
4. Retail: Monitoring, observing & analyzing the costumer's body language.
5. Airport Security: Detection of any doubtful behaviors of travelers e.g. timely identify and catch terrorists before the any untoward incidents.

Brainwave sensing: In brainwave sensing, the users are able to control multiple functions with brain waves without using their hands or any other body part. This technology can be used in toys, defense, aviation, aerospace, security, and many other applications and it is still evolving.

Virtual worlds: A virtual world is "Computer Based Simulated Environment" and it is widely used by nowadays. It's a technique in which virtual 3D environment is generated which looks very much real to the users. With the help of this, a single task can be done easily by many people simultaneously. We can make a personal profile and can even change our looks as well as our identity. Besides, one can design the environment around him and can also control the way of communication as well as his present motion. In future, when people will reach home, they will be able to make their own beautiful islands with a 5-star hotel or big houses. Our friends can even come over to a party with us through a teleporter, just like in the movie "Tron" or "The Matrix". This technology can also be applied to tourism, health, e-commerce, entertainment and of course in social networking etc.

A VVirtual device
Source: Unsplash by Bram Van Oost



TAKE NOTE

Figure 5.4.1: ICT trends in the 20th Century (Source: Tareen, 2016)

The ICT trends that are challenging many of the delivery models fundamental to formal education in the educational sector include:

Mobile Learning: New advances in hardware and software are making mobile "smart phones" indispensible tools. Just as cell phones have leapfrogged fixed line technology in the telecommunications industry, it is likely that mobile devices with internet access and computing capabilities will soon overtake personal computers as the information appliance of choice in the classroom.

Cloud computing: Applications are increasingly moving off of the standalone desk top computer and increasingly onto server farms accessible through the Internet. The implications of this trend for education systems are huge; they will make cheaper information appliances available which do not require the processing power or size of the PC. The challenge will be providing the ubiquitous connectivity to access information sitting in the "cloud".

One-to-One computing: The trend in classrooms around the world is to provide an information appliance to every learner and create learning environments that assume universal access to the technology. Whether the hardware involved is one laptop per child (OLPC), or – increasingly -- a net computer, smart phone, or the re-emergence of the tablet, classrooms should prepare for the universal availability of personal learning devices.

Ubiquitous learning: With the emergence of increasingly robust connectivity infrastructure and cheaper computers, school systems around the world are developing the ability to provide learning opportunities to students "anytime, anywhere". This trend requires a rethinking of the traditional 40 minute lesson. In addition to hardware and Internet access, it requires the availability of virtual mentors or teachers, and/or opportunities for peer to peer and self-paced, deeper learning.

Gaming: Research has shown that online game experience is extremely common among young people and that games offer an opportunity for increased social interaction and civic engagement among youth. The phenomenal success of games with a focus on active participation, built in incentives and interaction suggests that current educational methods are not falling short and that educational games could more effectively attract the interest and attention of learners.

Personalized learning: Education systems are increasingly investigating the use of technology to better understand a student's knowledge base from prior learning and to tailor teaching to both address learning gaps as well as learning styles. This focus transforms a classroom from one that teaches to the middle to one that adjusts content and pedagogy based on individual student needs – both strong and weak.

Redefinition of learning spaces: The ordered classroom of 30 desks in rows of 5 may quickly become a relic of the industrial age as schools around the world are re-thinking the most appropriate learning environments to foster collaborative, cross-disciplinary, students centered learning. Concepts such as greater use of light, colors, circular tables, individual spaces for students and teachers, and smaller open learning spaces for project-based learning are increasingly emphasized.

Teacher-generated open content: Many online texts allow teachers to edit, add to, or otherwise customize material for their own purposes, so that their students receive a tailored copy that exactly suits the style and pace of the course. These resources in many cases complement the official textbook and may, in the years to come, supplant the textbook as the primary learning source for students. Such activities often challenge traditional notions of intellectual property and copyright.

Smart portfolio assessment: The collection, management, sorting, and retrieving of data related to learning will help teachers to better understand learning gaps and customize content and pedagogical approaches. Also, assessment is increasingly moving toward frequent formative assessments which lend itself to real-time data and less on high-pressure exams as the mark of excellence. Tools are increasingly available to students to gather their work together in a kind of online portfolio; whenever they add a tweet, blog post, or photo to any online service, it will appear in their personal portfolio which can be both peer and teacher assessed.

Teacher managers/mentors: The role of the teacher in the classroom is being transformed from that of the font of knowledge to an instructional manager helping to guide students through individualized learning pathways, identifying relevant learning resources, creating collaborative learning opportunities, and providing insight and support both during formal class time and outside of the designated 40 minute instruction period. This shift is easier said than done and ultimately the success or failure of technology projects in the classroom hinge on the human factor and the willingness of a teacher to step into unchartered territory.

In healthcare, the following are ICT trends that are revolutionalizing the industry:

Drug Management: Drug management remains a challenge for medical facilities. With thousands of medications being administered in a typical hospital daily, the opportunity for error is great. But the Internet of Medical Things (IoMT) promises to help healthcare professionals and their patients to virtually eliminate these problems. Connected medical devices could potentially sound an alert if staff brings the wrong medication into a patient's hospital room. And IoMT devices embedded inside pills can alert monitoring systems exactly when the patient took the medication.

Smart Biosensors: Smart sensors that monitor vital signs and other health. A large percentage of this market will involve not just sensors, but sensors that can think. The potential for medical sensors that know when to share data is yet unfathomable. Sensors for monitoring glucose, heart activity, blood coagulation, blood gases, and a myriad of other biological processes are nothing new. However, adding IoMT connectivity to them opens a whole new world of applications and benefits.

Big Data and AI: Among the top healthcare IT trends are Big Data and artificial intelligence. While AI seems to be quite able to thrive on its own, Big Data needs AI if it is to be useful. Conventional data processing is simply incapable of sorting through reams of terabytes. AI can sort through the same data fast enough to yield useful information while the data is still relevant. For this reason, Big Data applications usually include an AI component.

Predictive Analytics: AI may not be a crystal ball, but it gives medical professionals valuable insight in how to best treat their patients. Unlike any doctor, AI can analyze over 100,000 data points per patient, and can predict which ones are most likely to be readmitted. Predictive analytics can do other things, too, like suggest treatments, detect disease, and even identify genetic factors affecting the patient.

AI Improves Cancer Detection: Cancer remains a major killer. Despite billions spent on research, survival rates for advanced-stage cancers remain dismally low.

Smart Medical Devices: Like the medical professionals they serve, medical devices are getting smarter by the day. One example is Philips Healthcare's IntelliVue Guardian Solution.

A Linear Accelerator
Source: Unsplash by National Cancer Institute

The wearable patient monitoring system tracks patients' vital signs. Using AI software, the system can predict health crises before they occur, giving doctors a head start in treating the patient.

AI Improves Medical Imaging: Within the healthcare industry, nothing requires more processing power than medical imaging. From 3D panoramic x-rays to whole-body MRI scans, medical images are becoming immensely complex. Medical imaging technology is advancing rapidly. Fortunately, so, too, is AI technology. AI fills a critical need in medical imaging by processing imaging data. The millions of data points generated by medical scans is analyzed by AI, which identifies abnormalities among normal.

Medical Robots: A medical robot might not perform your appendectomy, but one might very well assist the surgeon who does. A medical robot is made up of cameras and articulated robotic arms. Specialized video cameras peer into the area of the body being operated upon. The high-zoom, high-resolution cameras give the surgeon a super-human view of the surgical area. Using any of various attachments, the robot arm can — under control of the surgeon — make incisions, tie sutures, and cauterize blood vessels, among other things. The robot arm cannot operate on its own — at least not yet. The functions of the arm are controlled by the surgeon through a control panel or hand controls. Even though the surgeon has to control the robot, software minimizes the minute errors that any surgeon can make, for example, greater precision, shorter hospitalization, smaller incisions, minimized infection by not having more of the body cavity opened than necessary, reduced pain and discomfort.

In the agricultural sector, ICT trends include:
IOT and Sensors in the Field: Sensors placed strategically around fields along with image recognition technologies are allowing farmers to view their crops from anywhere in the world. These sensors send farmers up to date information in real-time, so changes can be made accordingly to their crops.

IOT and Sensors in Equipment: Much like the technology within the field, sensors are being placed on agricultural equipment to track the health of the machine and more. Using the term "precision agriculture" tractors and other farming equipment

Drones and Crop Monitoring: Drones are being used for crop monitoring and as a means to combat drought and other harmful environmental factors. Drones that produce 3D imaging can be used to predict soil quality through analysis and planning seed planting patterns. Drones are also being used to spray chemicals on crops while being careful not to penetrate groundwater.

A Drone
Source: Unsplash by Samsung Memory

Farming and Robotics: Much like using robots and artificial intelligence in other industries, robotics within agriculture would improve productivity and would result in higher and faster yields. Such robots like the spraying and weeding robots.

A Tracking Device
Source: Unsplash by Brecht Denil

RFID Sensors and Tracking: After crops are harvested, RFID sensors can be used to track food from the field to the store. The end user, or the consumer, will be able to follow a detailed trail about the food they consume from the farm it came to the location where it was purchased. This technology could increase trustworthiness for manufacturers and their responsibility to provide fresh produce and goods.

In e-commerce, the current trends in ICTs include but not limited to the following:

Voice assistants: new and effortless ways to shop, AI: a more personalized ecommerce experience, Robot packaging for Click & Brick automation, Ecommerce optimization: a revolution in ecommerce development, Virtual reality: delight and mesmerize your customers, Dynamic shopping experience, Mobile Optimization, Product Customization, Product Visualization, Augmented Reality, and Virtual Reality, etc.

Summary

we have been able to discuss the future trends as far as information and communication technologies are concerned. In the health sector, it includes: drug management, smart biosensors, predictive analytics, smart medical devices, AI improving cancer detection and medical imaging, medical robots, etc. In the educational sector, trends in ICT are: mobile learning, cloud computing, one-to-one computing, ubiquitous learning, gaming, personalized learning, teacher-generated open content. Trends in the agricultural sector include: IoT and sensors in the field, IoT and sensors in equipment, drones and crop monitoring, farming and robotics, RFID sensors and tracking.

Self-Assessment Questions

1. What are the future trends of ICTs in the agricultural sector?
2. Highlight the future trends of ICTs in the education sector.
3. Explain how ICTs have revolutionalised the healthcare industry.

Tutor-Marked Assignment

1. Virtual classroom is an example of the future trend in the _____ sector.
2. One future trend in e-commerce industry that will delight and mesmerize your customers is _____.
3. What in your opinion will be the consequences of driverless cars?
4. Analyze the ethical concerns of some ICT trends in the health sector.

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Further Reading

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