

# **Information and Communication Technologies**

## **Foundations of Technology (ITEA 17)**





# Outcomes

In this lesson you will learn:

- Information and communication technologies include the inputs, processes, and outputs associated with sending and receiving information. (ITEA 17-L)
- Information and communication systems allow information to be transferred from human to human, human to machine, and machine to machine. (ITEA 17-M)
- Information and communication systems can be used to inform, persuade, entertain, control, manage, and educate. (ITEA 17-N)
- Communication systems are made up of source, encoder, transmitter, receiver, decoder, storage, retrieval, and destination (ITEA 17-O)
- There are many ways to communicate information, such as graphic and electronic means. (ITEA 17-P)
- Technological knowledge and processes are communicated using symbols, measurement, conventions, icons, graphic images, and languages that incorporate a variety of visual, auditory, and tactile stimuli. (ITEA 17-Q)

# Communication



What is communication? The first thing most people think about is speaking to another person. This is communication but communication is also much more. Communication is defined as the exchange of thoughts, messages, or information, by speech, signals, writing, or behavior.

You can draw a picture communicating information. The picture shows a person what you know. You can take a photograph communicating what you know, use a symbol, or develop a sign representing the information. The use of drawings, symbols, and measurements promotes clear communication by offering a general language with which to convey ideas.





# Communication Technologies

Communication is the act of exchanging ideas, information, and opinions. It involves a message someone wants someone else or something else to receive. When we use technical equipment in communicating, it is called **communication technology**.

Communication Technologies along with Information Technologies include the inputs, processes and outputs associated with sending and receiving information. All of these parts are necessary if information is to be shared and understood by the sender and receiver.





# Inputs, Processes, Outputs

The fundamental components of communication are the sender, receiver and the information being communicated.

When we use communication technologies the sender must input the information into the technology being used. The technology will then process the information and output it to the receiver.

**Inputs, processes and outputs** are keys to communication technology. There can be no information exchange between sender and receiver in a communication technology system if one of these elements is missing. For information to be shared and understood all pieces of the communication or information system must not only work but work together.

Communication technologies and Communication systems can have many forms of **input**. Typing on your keyboard to enter information is a input process and the keyboard is the input device. A microphone, a television camera and the plates of a printing press are all examples of devices we input information to so that we can communicate.





# Processes

To communicate through the web you use your keyboard, mouse and computer to input information through text and images. The process of coding this information in HTML (Hypertext Markup Language) and having it decoded by a web browser is what make communicating via the web possible. Again, it is the information being processed that allows for the communication technology to work.

Processes are what happens to the information so that it can be communicated. Most times this has to do with some type of conversion or coding. When you speak into a microphone the energy from your voice is converted to electrical energy. It is then relayed to an amplifier or speakers to be converted back to sound energy and output. The process of converting the signal from audio energy to electrical energy is what makes the communication possible.



# Outputs



After the message or information has been input by the sender into the technology system. It is then processed by the technology to begin communication. The message must finally be output to the receiver for communication to be complete. As with inputs and processes there are many different way messages can be output.



- Your computer can decode an e-mail and output it through a monitor or printer.
- When printing plates are smeared with ink and pressed against newsprint the output is a newspaper with information we can read.
- Information input to a video camera can be output using a TV. Speakers broadcast the messages



# Information and Data

Information has become such a valued commodity in today's society that many commercial companies are involved in information and communication technologies. Information and the transfer of information have become such an icon of today's society that we refer to the current time as the Information Age.

People often use the terms **information** and **communication** together. These terms are related, but each means something different. To help us distinguish and better understand Information and Information technologies we must first look at the term **data**. Data includes individual facts, statistics (numerical data), and ideas. These facts and ideas are not sorted or arranged in any manner.

**Information** is data that has been sorted and arranged. It consists of organized facts and opinions people receive during daily life. Changing data into information is called **data processing** or **information processing**.



← Data

Info →







# Four Means of Information Transfer

To distinguish between the four means of information transfer you need to look at the communication in terms of sender and receiver.

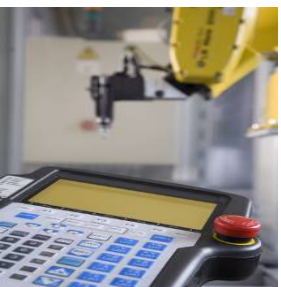
We are familiar with people communicating with people. This type of communicating is the most common. It works through our verbal dialogue, electronic media and our printed products. Even if you are using a piece of technology, if the sender and receiver are both human it is still **human to human communication**. For example: talking to a friend on the phone is human to human communication.



Have you input information into a computer or set the temperature on a thermostat? When a human inputs information to a machine, computer, or other automated system that will be used by the machine or system this is called **human to machine communication**. This type of information transfer usually starts, changes, or ends a machine's operations.



Have you ever reacted to a traffic light or a warning light on the dashboard of your car? Do you look at the temperature gauge on your oven or listen for the bell that indicates the end of a class period? When a machine or system provides information to a human this is called **machine to human communication**. This type of information transfer is widely used to display machine operating conditions.



Ever cashed a check or taken money out of an ATM that wasn't operated by your bank? If so you've initiated machine to machine communication. When you completed these transactions your bank's computer systems contact another bank's systems, or vice versa, and the two systems transfer information about your bank account. **Machine to machine information transfer** is when one machine or automated system communicates with or controls another machine or system. Modern industry is becoming more computer based. Typical examples of computer-controlled operations are computer-aided design (CAD), computer-aided manufacturing (CAM), computer-integrated manufacturing (CIM), and robotics.

# Applications of Communication and Information Systems



Information and communication systems can be used to...

1. **Inform** by providing information about people, events, or relationships. We read books, magazines, and newspapers to obtain information. Radio news programs, television news programs, and documentaries are designed to provide information.
2. **Persuade** people to act in a certain way. Examples include the “Say No to Drugs,” “Buckle Up” and “Give a Hoot, Don’t Pollute” campaigns. Print and electronic advertisements, billboards, and signs are typical persuasive communication media.
3. **Entertain** people as they participate in or observe events and performances. Information and communication technologies not only enhance entertainment but bring it to us as well. Television programs, movies, and novels are common entertainment-type communication.
4. **Control** other automated machines or systems. The example of the thermostat regulating the heater and air conditioner in a house is an example of one information system controlling another. The thermostat analysis the information it is given about the temperature of the house and controls the other devices accordingly.
5. **Educate**: Computers and the internet are great tools to promote the sharing of information. When information is shared people learn. Viewing this presentation is helping to **Educate** you about technology.
6. **Manage** other systems is similar to the way in which they apply control. A chemical companies computer system may detect that a tank has too much pressure on it. The system can manage the problem by venting some material from the tank. The technology does not control the whole system but manages a part of it.





# Merging Applications of Communication

Some applications may be merged into one. Two new words in our language arise from this merging of goals. The first is *infotainment*, which means providing information in an entertaining way. You may learn as you watch a quiz show on television or play with video games and computer simulations. Both of these are enjoyable ways of gaining new and useful information.

The second term, *edutainment*, takes communication one step beyond infotainment. Edutainment is more than allowing the information to be available in an entertaining way. It creates a situation in which people want to gain the information. The television program ***Sesame Street*** is a good example of edutainment.

# 8 Components of Communication Systems

The classic communication system is made up of eight (8) components:

- **Source** can be defined as a person or document that supplies information. You cannot have communication without information. The source supplies the information. **Example:** a news reporter gets his or her information from a reliable source.
- **Encoder** is a device used to change a signal or data into a code. **Example:** when the news reporter gathers his or her information he or she presents a report in front of a camera. The camera interprets the visual signal and encodes it to an electrical signal that can be transmitted.
- **Transmitter** is an electronic device that generates and amplifies a carrier wave, modulates it with a meaningful signal derived from speech or other sources, and radiates the resulting signal from an antenna. This is how the signal of the news broadcast is sent out to viewers.
- **Receiver** is a device, such as a part of a radio, television set, or telephone, that receives incoming radio signals and converts them to perceptible forms, such as sound or light. In the case of our news report a satellite dish, cable box or an antenna would work as the receiver.
- **Decoder** is a device that decodes a scrambled electronic signal to make it interpretable. After the cable box or satellite dish receives the signal of our news broadcast, a TV is needed to descramble the signal to reproduce the images the camera originally encoded.
- **And...**







# 8 Components of Communication Systems



- **Storage** Once we have the signal interpreted into a usable form we can store it if we need. We could store the news broadcast on a tape, DVD or DVR. **Storage** is defined as the part of a system that stores information for subsequent use or retrieval.
- **Retrieval** is defined as the process of accessing information from memory or other storage devices. In our case would need a DVD player or VCR to retrieve the information we stored.
- **Destination** is the ultimate purpose for which something is created or intended. After information from a source is encoded, transmitted, received, decoded, stored and retrieved it has most likely achieved its ultimate purpose whether it be entertainment, education or a combination of the two.
- **Feedback** may be included in this process as well.



# Graphic and Electronic Communication

There are many ways to communicate information, such as graphic and electronic means.

**Graphic communication** systems involve the design, development, and production of visual images. Examples of graphic systems include printing and photochemical processes, while examples of **electronic communication** systems are computers, DVD players, digital audiotapes, and telephones. Communication and information technologies are part of every day life. Graphic and electronic communication play huge roles in the information transfer process. These two types of media provide us with more ways to send and receive information.



# Graphic Communication

***Graphic communication*** systems involve visual messages, such as words and pictures — newspapers, magazines, and print media exemplify this type of communication. Graphic communication may be conducted using drawings, pictures, graphs, or photographs.





# Design and Development



The first stage in the creation of a piece of graphic communication is its ***design***. This job is usually undertaken by a *graphic designer*. Graphic Designers are responsible for creating icons and logos for companies and businesses as well as other forms of visual information that can be used in advertisement, publication and websites.

The ***Development*** of a logo, icon, or other piece of graphic communication can include many revisions. The idea usually starts as a thumbnail sketch in the design stage. Once a design is selected it is refined, enhanced and presented to a client. The client can request more refinements to better suit their needs before the item goes into production.



# Production, Printing, Photochemistry



When the development of a piece of visual information is complete it goes into production. **Production** involves replicating or distributing a piece of graphic communication. When companies print their logo on the bags they use to distribute their product they are putting visual information into production.

Graphic communication can be expressed through **printing**. There are many different ways to print. Screen printing, where ink is pressed through a stretched silk screen is often used for T-shirts, Hats, DVDs and CD's. Offset Lithographic printing, where ink is transferred between printing plates is used for most document printing.

Photochemistry is more than just the chemicals used to develop photographs. **Photochemistry** is defined as the chemistry of the effects of light on chemical systems. Photochemicals do create both color and black and white photos but they are also used in the creation of holograms and the silk screens mentioned on the previous slide.

# Electronic Communication



***Electronic Communication*** is defined as the science and technology of communication at a distance by electronic transmission of impulses. Traditional means of electronic communication were: telegraph, cable, telephone and radio. Today's common technologies include computers, television, DVD and cell phones.

As we have seen before, information can be expressed in various forms. ***Electronic Information*** can be formatted as digital (discrete bits) or analog (continuously variable signals). The difference is in the way the information is encoded transmitted and stored.

# Digital and Analog



Digital Signal



Analog Signal

**Digital** information is stored in defined increments. Binary Code is the most commonly used system when it comes to transferring digital information. The Binary Code is made up of all 0's and 1's. Basically anything can be stored in binary code depending on how it is written and read. Computers use this system because all information is clearly defined; 0 or 1, off or on, yes or no.

Unlike digital signals, **Analog** signals are not clearly defined and can fluctuate. Instead of being classified as in definite increments a analog signal flows depending on the strength of the signal.



# Communicating Knowledge and Processes

Technological knowledge and processes are communicated using symbols, measurement, conventions, icons, graphic images, and languages that incorporate a variety of visual, auditory, and tactile stimuli. To better understand how knowledge and processes are communicated let's first look at the senses that they appeal to.

Graphic Communication appeals to a person's visual perception and stimuli. An image like an illustration can demonstrate a process. **Visual** refers to anything relating to the sense of sight. Some knowledge and processes are best communicated through a visual media.



**Auditory** stimuli appeal to our sense of hearing. Warning buzzers, alarms, and timers can communicate that we are in danger or that some action needs to be taken. A door bell can let us know that a friend has arrived. Music can also communicate a message while appealing to our sense of hearing.




**Tactile** stimuli appeal to our sense of touch. Items can be textured differently, been given different coatings or made of different materials so that they feel differently. This difference in feel can provide us with information. Remote controls often put bumps on some buttons so that you can feel where your fingers are on the remote without looking.









# Communicating Knowledge and Processes



A **Symbol** is an object associated with and serving to identify something else. For example, the international symbols developed for transportations systems have helped to communicate critical information to travelers: a circle with a slash represents “No” or “Do Not Do”. New technologies generate new symbols, due to e-mail and instant messaging must people know :) is a symbol for happiness or approval.



**Measurement** is the estimation of a physical quantity such as distance, energy, temperature, or time. Measurements set a standard so that people can communicate physical quantities to each other. In 1960 the international system of units (SI) was developed so that scientists would all have a common language to communicate their research.



**Icons** and **Graphic Images** use visual cues to communicate information. Like symbols, they are easily identifiable and usually cross language barriers. A common examples of icons are the icons on computers. These icons can identify file type or represent programs. Graphic images can be diagrams that display how something is done. The image to the left explains that something needs to be cut.

**Language** is defined as the communication of thoughts and feelings through a system of arbitrary signals, such as voice sounds, gestures, or written symbols. Languages mainly appeal to the auditory and visual stimuli but in the form of Braille it can address the tactile stimuli. New languages can develop as a product of new technologies an example being the abbreviations used in instant messaging and text messages.

# Summary

- Communication is defined as the exchange of thoughts, messages, or information, by speech, signals, writing, or behavior
- When we use technical equipment in communicating, it is called communication technology
- Communication Technologies and Information Technologies include the inputs, processes and outputs associated with sending and receiving information.
- The fundamental components of communication are the sender, receiver and the information being communicated.
- Information Technologies transfer information and communicate in four different ways, in terms of sender and receiver: human to human, human to machine, machine to human, machine to machine
- Communication and information systems can be used for many different applications are mainly used to address six applications; inform, entertain, educate, control, manage and persuade
- The classic communication system is made up of an information source, an encoder, a transmitter, a receiver, a decoder, storage, retrieval, and an information destination.
- Graphic communication systems involve the design, development, and production of visual images
- **Graphic communication** systems involve visual messages, such as words and pictures
- **Electronic Communication** is defined as the science and technology of communication at a distance by electronic transmission of impulses
- **Electronic Information** can be formatted as digital (discrete bits) or analog (continuously variable signals)
- Technological knowledge and processes are communicated using symbols, measurement, conventions, icons, graphic images, and languages that incorporate a variety of visual, auditory, and tactile stimuli

