

# Basics of Technical Communication

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## INTRODUCTION

In your academic environment, you encounter various situations involving speech or writing: conversation with your friends, professors, or office staff to achieve various purposes; seminars, group discussions, written tests, and examinations; and laboratory or project report submissions on diverse topics. Likewise, when you take up a profession after completing your studies, you will have to interact with your superiors and subordinates, conversing with them face to face or over the telephone, and read and write e-mails, letters, reports, and proposals.

All these activities have a common denominator—*the sharing of information*. For example, when you request your professor to explain a concept which you could not understand very well in the class, you transmit the information to him that you need some clarification. Now, the professor receives this information, understands it and responds by giving an explanation which clears your doubt. If you are satisfied with this explanation, you thank the professor and the communication comes to an end. If you are still in doubt, you once again request clarification, and the process continues. This process involving the transmission and interchange of ideas, facts, feelings, or courses of action is known as the *process of communication*. You give, get, or share information with others during this process. Whether you communicate orally or in writing, this process essentially remains the same.

## 2 Technical Communication

When you become a part of any organization, you need to communicate, and communicate effectively. No organization can survive without communication. All the activities an organization undertakes have communication at their hub. The better your communication skills, the greater are your chances of quick progress. However skilful you may be in other aspects of your work, knowledge, thoughts, and organization, sans communication are of little use. For instance, though you may possess an excellent academic record, you may not emerge victorious in an interview if you are not able to express your ideas clearly to those on the other side of the table. You may have observed that people at the pinnacle of their profession generally have excellent communication skills, one reason for their rapid rise up the ladder of success. So let us find out more about the communication process and what role it plays in an organization.

### THE PROCESS OF COMMUNICATION

Communication can be defined as the exchange of information, ideas, and knowledge between sender and receiver through an accepted code of symbols.

The word communication has its root in the Latin word *communicare*, which means to share, and this sharing is of information, knowledge, and thoughts. For sharing information, you require two parties, the sender and the receiver, without which communication cannot take place. However, it is not sufficient to have two parties; there should also be cooperation and understanding between them. They should have a mutually accepted code of signals making up a common language. Communication can be defined as the exchange of information, ideas, and knowledge between sender and receiver through an accepted code of symbols. It is termed effective only when the receiver receives the message intended by the sender in the same perspective. Otherwise it is miscommunication.

#### The Communication Cycle

Consider the communication process as shown in Figure 1.1.

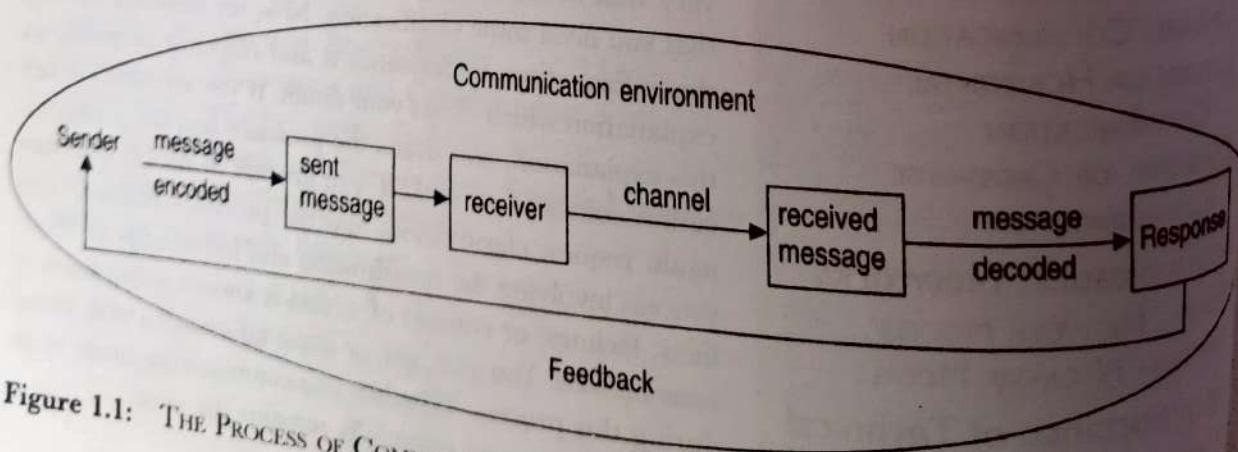


Figure 1.1: THE PROCESS OF COMMUNICATION

The *sender* encodes the *message* and sends it through a *channel*. This channel is nothing but the language used—words, actions, signs, objects, or a combination of these. The *receiver* receives the message, decodes it, and acts on it. If the message received is the same as the message sent, there will be a response; if not, there has been a breakdown of communication. This may happen because of ‘noise’. The reasons for noise production have been discussed in detail in the latter part of this section.

The transmission of the receiver’s response to the sender is called *feedback*. Feedback is essential as it is a barometer of effective communication. If you are sending a message to somebody, your communication cycle is complete only when you get a response from the recipient of your message. Otherwise, you need to resend the message. Of course, even if you receive a response, it may or may not be the one you had expected. But once you receive some response, you know that you have communicated your message to the other party successfully. For example, you put up a notice asking the members of your student council to attend a meeting on a specified date, at a particular time, at the location mentioned. On the day of the meeting, you find that some of them have come while the others have not turned up. In this case you have obtained both the positive and negative responses to your message. But since you have got some feedback, the communication process is complete. Also, it has been effective, at least from your side. Hence, to understand whether you have communicated successfully or not, you must get feedback which is your observation of the recipient’s response. Your communication is fully effective only when you get the desired response from the receiver.

Communication takes place in a well-defined set-up. This is called the *communication environment*. A classroom is the communication environment when a teacher delivers lectures to students. A teacher’s cubicle becomes the communication environment when a student privately approaches the teacher.

Messages themselves are transferred through a medium, the *channel*. In oral communication, the air or telephone wires are commonly used channels. Language is the tool we use through these channels to exchange information.

In brief, the *essentials of effective communication* are:

- A common communication environment
- Cooperation between the sender and the receiver
- Selection of an appropriate channel
- Correct encoding and decoding of the message
- Receipt of the desired response and feedback

### **Noise**

When you communicate, you desire that the message received should be the same as the message sent. But you might notice that this is not always the case.

#### 4 Technical Communication

Noise is defined as any unplanned interference in the communication environment, which causes hindrance in the transmission of the message.

Sometimes, this is due to the presence of *noise*. Noise is defined as any unplanned interference in the communication environment, which causes hindrance in the transmission of a message. Noise distorts interpretation or the decoding part of the communication process.

Noise can be classified as *channel* and *semantic*. Channel noise is any interference in mechanics of the medium used to send a message. Familiar examples of channel noise are distortion due to faulty background, noise in telephone lines, or too high a volume or pitch from loudspeakers. In written communication, illegible handwriting can be termed as channel noise.

Whereas channel noise develops externally, semantic noise is generated internally resulting from errors in the message itself. It may be because of the connotative meaning of a word allowing the meaning to be interpreted differently by the sender and the receiver. For example, the word 'condescend' may be used in a positive manner implying graciousness or dignity of manner, but the receiver might interpret it in a negative manner, related to a (baseless) assumption of superiority. Other examples of semantic noise are ambiguous sentence structure, faulty grammar, misspelling and incorrect punctuation.

### General and Technical Communication

Communication is important not only in an organization but also in daily life. In everyday life, you will find that communication occurs everywhere. It is an integral part of daily activity. When your alarm clock goes off, it is communication through sound and urges you get out of bed. When you use a particular brand of toothpaste while brushing your teeth, it is because of the impact of the company's persuasive advertising or its salesman's spiel, both being effective forms of communication. You watch the morning news on TV—communication. You say goodbye to your family as you leave home—this is communication. You call for a cab and tell the driver to head for your office—this is communication. At your work place, all activities revolve around communication, be it oral or written. Your boss calls to tell you about your increment—this is communication again. At the end of the



Table 1.1:

- General communication**
- Contains a message
  - Informal in nature
  - No set pattern
  - Mostly oral
  - Not always meaningful
  - Doesn't involve writing

Language elements combine in different ways to communicate ideas in a meaningful way. By changing the word order in a sentence, you change its meaning and even make it meaningless.

day, you return home and read the newspaper—this is communication once more. Finally, you retire to bed and dream—this is also communication, this time with yourself. Messages that are non-technical or informal in nature are categorized as general purpose communication, whereas messages pertaining to technical, industrial, or business matters belong to the category of technical or business communication. Table 1.1 shows the differences between the two categories.

**Table 1.1:** CHARACTERISTICS OF GENERAL AND TECHNICAL COMMUNICATION

General communication	Technical communication
<ul style="list-style-type: none"> <li>Contains a general message</li> <li>Informal in style and approach</li> <li>No set pattern of communication</li> <li>Mostly oral</li> <li>Not always for a specific audience</li> <li>Doesn't involve the use of technical vocabulary or graphics, etc.</li> </ul>	<ul style="list-style-type: none"> <li>Contains a technical message</li> <li>Mostly formal</li> <li>Follows a set pattern</li> <li>Both oral and written</li> <li>Always for a specific audience</li> <li>Frequently involves jargon, graphics, etc.</li> </ul>

## LANGUAGE AS A TOOL OF COMMUNICATION

*Language employs a combination of words to communicate ideas in a meaningful way. By changing the word order in a sentence, you can change its meaning, and even make it meaningless.*

It is a well-established fact that effective communication is made possible with the help of language. You do not have to be a linguist in order to acquire good language skills. However, a basic knowledge of the theory of language will certainly help you to understand the intricacies of writing and speaking clearly. So let us look at some of the basic features of language.

When you try to define language, the first thing that comes to mind is *words*. Language employs a combination of words to communicate ideas in a meaningful way. By changing the word order in a sentence, you can change its meaning, and even make it meaningless.

How did words acquire their meanings? What, for example, is the connection between a wooden plank balanced on four legs and the word ‘table’? The answer is that there is no obvious correlation between the symbol and its meaning, as language is arbitrary. When language first came into being, a community of people agreed to represent a certain object or idea by a specific sound or symbol. In the very first words, there may have been some correlation between the symbol and the sense—they may have been onomatopoeic. A few such words that still persist in the English language are *buzz*, *drizzle*, and *murmur*. In fact most words evoke certain meanings because people have agreed that the symbols (words) represent specific meanings. Thus language is directly dependent on people and cannot exist in isolation. It arose out of the human need to communicate. Primitive man communicated only with sign language and cries. Much later, as human beings became more interdependent and complex, language came into being. Of course, though it is accepted that language is universal, it cannot be denied that it is also

specific to the individual. When you use it, you reflect your personality and thoughts.

## Characteristics of Language

Let us now consider how language operates. When you think of any event, numerable pictures come to your mind. For instance when you think of your oral presentation, you recall the audience's expressions, the dimly lit room, the podium, and your own nervousness.

All of us carry such images in our minds. And these memories of our experience shape our ideas and influence our thoughts and actions. If you experience something new, you alter your viewpoint. Individuality is the sum of all these myriad experiences. This is the reason people have varied viewpoints.

People use language to give shape to their experiences. Since language is not exact, many a time it leads to misunderstandings. Being aware of the basic characteristics of language can help us understand this better and communicate more effectively.

According to the ideas put forward by eminent linguists such as Noam Chomsky and Ferdinand de Saussure, language is:

- artificial
- restricted
- abstract
- arbitrary
- creative
- redundant
- recursive

### Language is Artificial

Language is created by people. It doesn't exist in isolation or outside the minds of people. It is created by humans as they need it. Every symbol is attached to a particular thought or thing, called a *referent*.

Let us take the word 'AIDS', which did not exist until people were infected by this contagious disease. The process of how this word was created is easy to trace. But this is not always possible. For instance, the word 'nice' has changed its shade of meaning over a period of time. Irrespective of the etymology, more important is the fact that we select a word for use in a particular way from the limitless choices available. As noted before, there is no organic connection between a symbol and its meaning. Humans attach meanings to words as they need to and modify these meanings according to changing needs. This is why we say language is 'artificial'.

**Do you know how the meaning of 'nice' has changed over hundreds of years? Today 'nice' is used to describe something as 'good' in an abstract way. Its Latin root 'nescire' meant 'to be ignorant', and in thirteenth century English, it came to mean 'foolish, stupid'.**

### **Language is Restricted**

When we think and translate our thoughts into language, some meaning is lost in the process. No symbol or word can transmit the exact reality. That is one reason you sometimes find yourself saying that you cannot find words to express your feelings. This is because language is restricted. In other words, it has limitations.

Think of your alma mater. When you were in school, the building was new and modern. You called it 'your school'. After many years, it now looks antediluvian and dilapidated. You still call it 'your school'. Are not the same words being used to describe the building in its different states? If you want to give a more specific description, you have to supplement your words with other kinds of symbols or perhaps more words.

To overcome this limiting quality of language, people enliven their words with non-verbal cues to explain things better.

Language is only a sketch of the apparent and obvious. While communicating, we must keep two things in mind:

1. We must avoid mistaking a changed reality for an unaltered one because of unchanged language.
2. We need to use language as accurately as possible. When required, we should corroborate it with other available alternatives, such as non-verbal cues, graphical elements, or audio-visual recordings.

### **Language is Abstract**

We say language is abstract because it represents generalized ideas of things or thoughts. The idea which the word represents is different every time. For example, 'dress' can represent anything from a frock to a sari. Even if you are more specific and use the word 'business suit', you are still employing an abstraction, as a business suit can come in a variety of sizes and colours. To be abstract is to generalize, and to generalize is to leave out many details.

Abstractness is an important feature of language. It is this that makes all generalization possible. When we talk about a number of similar items, such as paper clips, pins, staples, etc., we can group them through abstraction, labelling their common features. This makes it possible to categorize, so that we need not constantly redefine the new information we receive. As we use already existing words, the task becomes easier. If this were not possible, we would never be able to make sense of things we have not experienced.

How does this happen? An existing word takes many similar ideas under its umbrella. A 'table' can be of different shapes and sizes, and still be called a table. Even if you have never seen a table with three legs, you can still identify it as a table. *This happens because meanings get associated with symbols and users keep expanding the range of meanings.*

We have already discussed the etymology of the word 'nice'. But, do you know how many meanings it had acquired that are currently in use? Here we list some of them:

1. pleasant, enjoyable, or attractive
2. kind; friendly
3. (ironic) bad or unpleasant
4. (formal) involving a very small detail or difference

Some of the obsolete meanings of 'nice' are 'wanton', 'profligate', 'affected', 'modest', and 'coy'.

### **Language is Arbitrary**

There is no direct relationship between a word and the idea or object it represents. People speaking a particular language accept the fact that certain symbols or sounds will represent a particular thing. For example, a 'table' could have been called by any other name, but these people speaking English accepted that a piece of furniture with four legs and a wooden plank used for keeping things will be called 'table'.

Language has evolved as a cultural system of agreements in which words represent certain symbols or thoughts. Learning these agreements is part of learning the language.

Sometimes this arbitrary aspect of language causes problems. When a word undergoes a change that may not be universally accepted, it might not be understood clearly. For example, the word 'verbal' means 'spoken, not written' and also 'connected with words or using words'. The same word is used to represent two different realities.

To summarize, language keeps changing to include new concepts, and words can attach a number of specific and arbitrary meanings.

### **Language is Creative**

Language is indeed very creative and you can marvel at its ability to generate many words every day. Every year innumerable words are added to the dictionary. These words can be added by different processes: *borrowing* (the taking over of words from other languages like, 'alcohol' from Arabic and 'boss' from Dutch), *constructing portmanteau words* (words made by combining the sound and meaning of two different words; e.g., netiquette = net + etiquette, edutainment = education + entertainment), *back formation* (where a word of one type, usually a noun is reduced to a word of another type, usually a verb, like 'opt' from 'option', and 'emote' from 'emotion') etc. As the need arises, a word is created to explain that particular thought or process. As computers inundated offices, new words such as 'keyboard' and 'emoticons' came into being. Meanings of other words—such as 'mouse', 'virus', and 'boot'—were expanded or modified.

Look at how the meanings of the following words have changed over a period of time.

Word	Earlier meaning	Current meaning
Egregious	Outstandingly good	Outstandingly bad
Maverick	Unbranded cattle (after owner who declined to brand his)	An outsider, admirable for unorthodox ways (positive connotation)

### Language is Repetitive

Whatever language you use, it has the capacity for redundancy or repetition. This may either improve or impede effective communication. Look closely, for example, at this simple sentence:

*A couple of girls are riding their bicycles.*

How many signals in it indicate the presence of more than one person? The first two are the plural nouns: *girls* and *bicycles*. The third is the agreement of the verbs *are riding*. The fourth and fifth are *couple* and *their*. We can accept that in this instance repetition of information makes the meaning clear.

On the other hand, excessive and unnecessary repetition, or redundancy, may lead to verbosity or wordiness without contributing to the meaning. For example, when you say 'All of you meet together to see me in the afternoon at 3 pm', you are using an excessive number of words to no purpose. Even if you leave out 'All of you' and 'afternoon', no confusion would arise. When redundancy is a problem, dispense with the words that are unnecessary.

### Language is Recursive

Recursiveness is the characteristic of language which enables you to generate any number of sentences using the same basic grammatical templates. It also allows you to express any idea, thought, or feeling using the same finite vocabulary.

Recursiveness implies that there is no limit to the potential length of a sentence. For example, consider the following statement:

*This man who is wearing a crumpled suit, which he borrowed from me to wear to his interview, which was on Wednesday, which was the day it was raining . . .*

If you use your imagination, you can see that this sentence can continue to any length if you keep on adding qualifying clauses for every noun. This is because the recursive quality of language here enables you to keep repeating the relative clause pattern.

So we can conclude that these basic characteristics of language make it an effective means of communication. However, one cannot deny that communication also takes place by non-verbal means, which have been discussed at length in Chapter 5.

## LEVELS OF COMMUNICATION

Human communication takes place at various levels:

- extrapersonal
- intrapersonal
- interpersonal
- organizational
- mass

### Extrapersonal Communication



Communication between human beings and non-human entities is extrapersonal. For example, when your pet dog comes to you wagging its tail soon as you return home from work, it is an example of extrapersonal communication. A parrot responding to your greeting is another example. More than any other form, this form of communication requires personal coordination and understanding between the sender and the receiver as least one of them transmits information or responds in sign language or

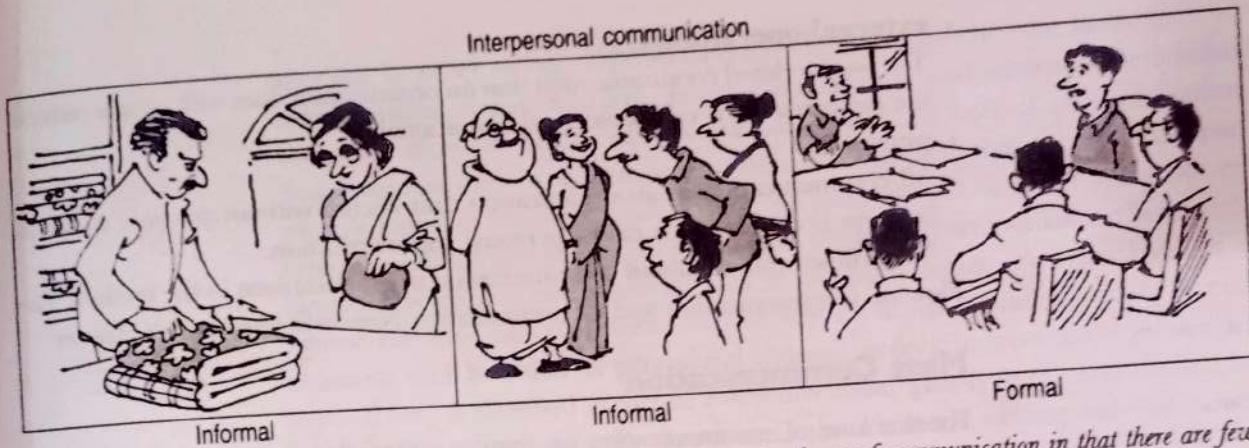


### Intrapersonal Communication

This takes place within the individual. We know that the brain is linked to all parts of the body by an electrochemical system. For example, when you begin to feel hot, the information is sent to the brain and you may decide to 'turn on the cooler', responding to instructions sent from the brain to the hand. In this case the relevant organ is the sender, the electrochemical impulse is the message, the brain is the receiver. Next, the brain assumes the role of sender and sends feedback that you should switch on the cooler. Then the process is complete. This kind of communication pertains to thinking, which is the basis of information processing. Without such internal dialogue, you cannot proceed to the further levels of communication—interpersonal and organizational. In fact, while you are communicating with the other party, internal dialogue with oneself continues concurrently—planning, weighing, considering, and processing information. You might have noticed that at times you motivate yourself or consciously resolve to complete a certain task. Self-motivation, self-determination, and the like take place at the intrapersonal level.

### Interpersonal Communication

Communication at this level refers to the sharing of information among people. To compare it with other forms of communication, we need to examine how many people are involved, how close they are to one another physically, how many sensory channels are used, and the feedback provided.



Interpersonal communication differs from other forms of communication in that there are few participants involved, the interactants are in close physical proximity to each other, there are many sensory channels used, and feedback is immediate. Also, the roles of sender and receiver keep alternating. This form of communication is advantageous because direct and immediate feedback is possible. If a doubt occurs, it can be instantly clarified. Note that non-verbal communication plays a major role in the interpretation of a message in this form of communication due to the proximity of the people involved.

Interpersonal communication can be *formal* or *informal*. For example, your interaction with a sales clerk in a store is different from that with your friends and family members; the interaction between the panel members and the candidate appearing at an interview is different from the conversation between two candidates waiting outside. Hence, depending upon the formality of the situation, interpersonal communication takes on different styles.

Moreover, most interpersonal communication situations depend on a variety of factors, such as the psychology of the two parties involved, the relationship between them, the situation in which the communication takes place, the surrounding environment, and finally the cultural context.

### **Organizational Communication**

Communication in an organization takes place at different hierarchical levels. It is extremely necessary for the sustenance of any organization. Since a large number of employees are involved in several different activities, the need to communicate becomes greater in an organization. With a proper networking system, communication in an organization is possible even without direct contact between employees. This kind of communication can be further divided into:

- **internal-operational**

All communication that occurs in conducting work within an organization is classified as internal-operational.

- **external-operational**

The work-related communication that an organization does with people outside the organization is called external-operational.

- **personal**

All communication in an organization that occurs without purpose as far as business is concerned is called personal communication.

You will learn more about communication in organizations in the sections Flow of Communication and Communication Networks later in this chapter.

## Mass Communication

For this kind of communication we require a mediator to transmit information. These are several mass media such as journals, books, television, and newspapers which mediate such communications. Since the messages are for a large audience that is heterogeneous and anonymous, the approach is impersonal. Press interviews given by the chairman of a large firm, advertisements for a particular product, service, and the like take place through mass media. This type of communication is more persuasive in nature than any other form of communication and requires utmost care on the part of the sender in encoding the message. Oral communication through mass media requires some equipment, such as microphone, amplifiers, etc., and the written form needs print or visual media. The characteristics of this type of communication are:

- **large reach**

Mass media communications reach audience scattered over a wide geographic area.

- **impersonality**

This kind of communication is largely impersonal as the participants are unknown to each other.

- **presence of a gatekeeper**

Mass communication needs additional persons, institutions or organizations to convey the message from sender to receiver. This 'gatekeeper' or mediator could be a person or an organized group of persons active in transferring or sending information from the source to the target audience through a mass medium. For example, in a newspaper the editor makes choices and decides which news makes it to the hands of the reader. The editor is therefore the gatekeeper in the mass communication process.

Manager 1

Figure 1.2:

## THE FLOW OF COMMUNICATION

Information flows in an organization both formally and informally. The term formal communication refers to communication that follows the official hierarchy and is required to be carried out.

one's job. In other words, it flows through formal channels—the main lines of organizational communication. Internal-operational and external-operational communication can be described as formal. In fact, the bulk of communication that a business needs in order to operate flows through these channels. For example, when a manager instructs a subordinate on some matter or when an employee brings a problem to a supervisor's attention, the act of communication is formal. Similarly, when two employees interact to discuss a customer's order, there is a formal communication. Information of various kinds flowing through formal channels, such as policy or procedural changes, orders, instructions, confidential reports, etc., is classified as formal communication. This type of communication can flow in various directions—downward, upward, lateral, or diagonal—as shown in Figure 1.2.

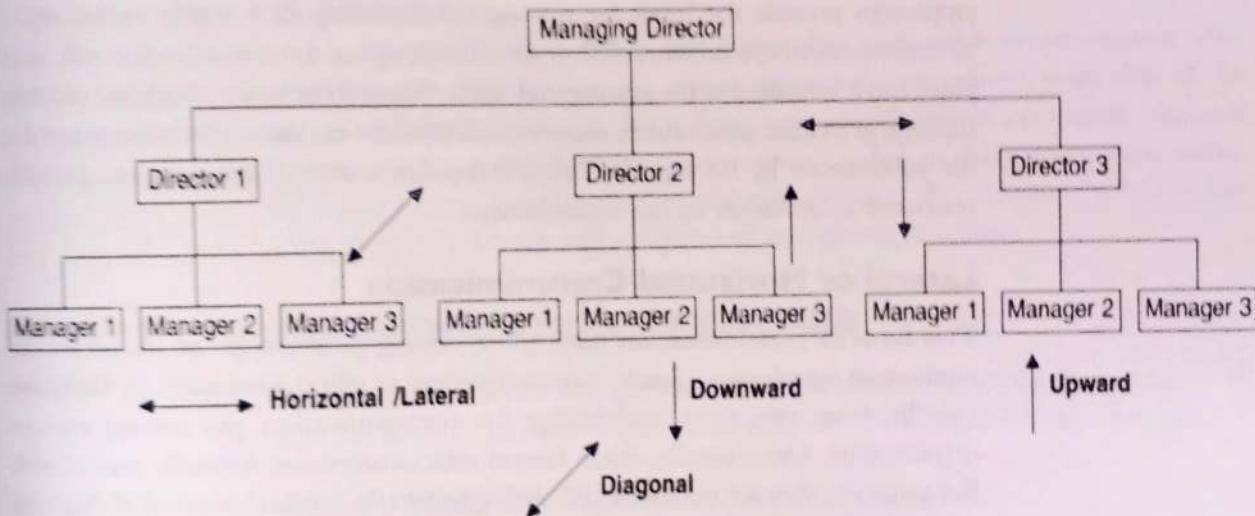


Figure 1.2: FLOW OF COMMUNICATION IN AN ORGANIZATION

### Downward Communication

*Downward communication* flows from a manager, down the chain of command. When managers inform, instruct, advise, or request their subordinates, the communication flows in a downward pattern. This is generally used to convey routine information, new policies or procedures, to seek clarification, to ask for an analysis, etc. Also, superiors send feedback about their subordinates' action through this channel. Such communication increases awareness about the organization among subordinates and employees and enables managers to evaluate the performance of their subordinates. Downward communication can take any form—memos, notices, face to face interactions, or telephone conversations. However, this should be adequately balanced by an upward flow of communication.

## Upward Communication

When subordinates send reports to inform their superiors or to present their findings and recommendations, the communication flows upward. This type of communication keeps managers aware of how employees feel about their job, colleagues and the organization in general. Managers also rely on upward communication for making certain decisions or solving some problems which concern the organization.

The extent of upward communication, especially that which is initiated from the lowest level depends on the organizational culture. In an open culture without too many hierarchical levels, managers are able to create a climate of trust and respect, and implement participative decision-making or empowerment. Here there will be considerable upward communication. This is mainly because employees provide the input for managerial decisions. In a highly authoritarian environment, where downward flow dominates, upward communication still takes place but it is limited to the managerial ranks. Suggestion boxes, employee attitude surveys, grievance procedures, superior-subordinate decisions (decisions taken for the subordinate by his superior), review reports, statistical analyses, etc. provide restricted information to top management.

## Lateral or Horizontal Communication

This form of communication takes place among peer groups or hierarchically equivalent employees. Such communication is often necessary to facilitate coordination, save time, and bridge the communication gap among various departments. Occasionally, these lateral relationships are formally sanctioned. But generally, they are informally created to bypass the formal hierarchical channels and expedite action.

From the organization's point of view, lateral communication can be either advantageous or disadvantageous. As compared to vertical (downward or upward) communication, which can at times impede and delay timely and accurate transfer of information, lateral communication can be beneficial. Nevertheless, they can also create conflicts when formal vertical channels are bypassed by employees in order to accomplish their goals, or when superiors find out that they had not been consulted before certain decisions were taken.

Lateral communication enables the sharing of information with a view to apprise the peer group of activities of a department. The Vice President (Marketing) sending some survey results in the form of a memo to the Vice President (Production) for further action is an example of lateral communication. This type of communication is very vital for the growth of an organization as it builds cooperation among the various branches. In such organizations where work is

### Formal network models

- chain network
- Y-network
- wheel network
- circle network
- all-channel network

decentralized, it plays a greater role because there is a higher probability of communication gaps.

### Diagonal or Cross-wise Communication

*Diagonal or Cross-wise Communication* flows in all directions and cuts across functions and levels in an organization. For example, when a sales manager communicates directly with the Vice President (Production), who is not only in a different division, but also at a higher level in the organization, they are engaged in diagonal communication. Though this form of communication deviates from the normal chain of command, there is no doubt that it is quick and efficient.

In some situations, ignoring vertical and horizontal channels expedites action and prevents other employees from being used merely as conduits between senders and receivers.

The increased use of e-mail also encourages cross-wise communication. Any employee can communicate via e-mail with another employee, regardless of the receiver's function or status. Since there is no specific line of command, diagonal communication is also referred to as cross-wise, radial, or circular communication, depending upon the structure of the organization. For instance, a Managing Director could directly call a supervisor and give instructions.

## COMMUNICATION NETWORKS

A variety of patterns emerge when communication combines through vertical and horizontal channels. These patterns are termed as *communication networks*.

### Formal Network Models

There are five common communication networks that come into play in formal communication in an organization as discussed below:

The *chain network* represents a vertical hierarchy in which communication can flow only upward or downward. We can find this type of network in direct line of authority communications with no deviations.

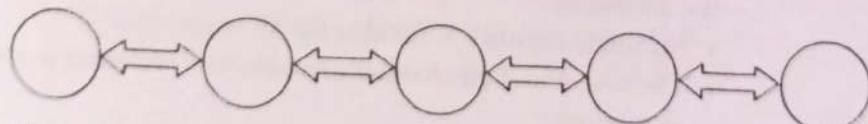


Figure 1.3: CHAIN NETWORK

The *Y-network* is in effect a multi-level hierarchy and a combination of horizontal and vertical flow of communication. If we turn the Y upside down, we see two subordinates reporting to one senior, with two levels of authority above the latter (Figure 1.4).

#### Formal network models

- chain network
- Y-network
- wheel network
- circle network
- all-channel network