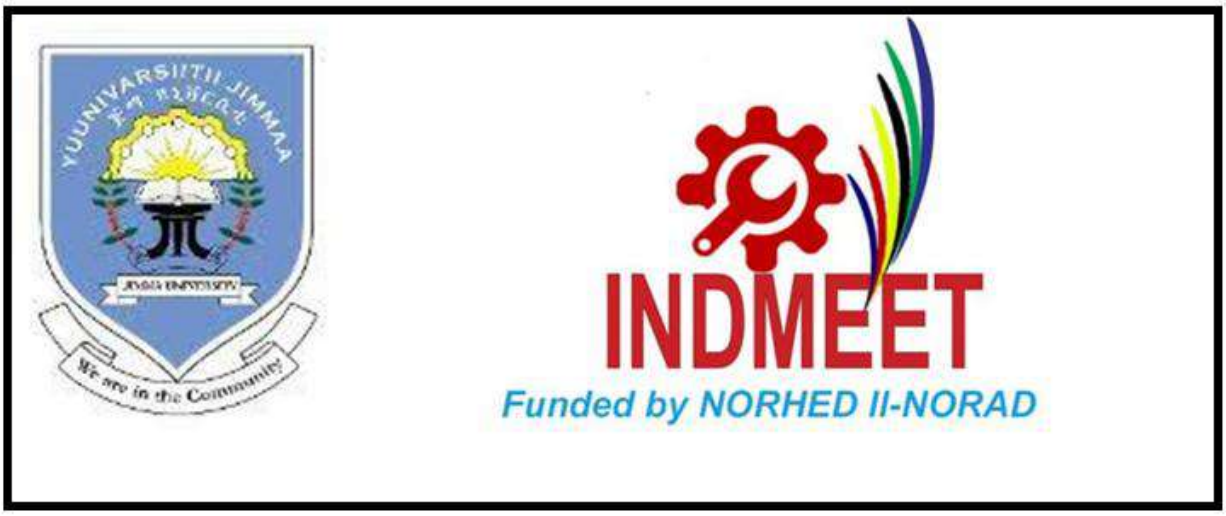

Module of Soft Skills for Engineers

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Summary

Soft skills" as a term in the world of work are associated with a person´s emotional intelligence, the cluster of personality traits, social graces, communication, language proficiency, personal habits, feelings, optimism and teamwork that characterize relationships with other people. Though soft skills are hard to quantify or measure, they are needed for everyday life as well as for work.

Objectives of module on soft skills for engineering is:

1. To present and highlight the fundamental role of soft skills in modern Engineering.
2. To provide some input and suggestions for a deeper knowledge of soft skills.
3. To provide input and suggestions on applying such skills in engineering activities and, why not, in everyday life.

Module outcomes

Soft skills provide an important complement to "hard skills" which are the occupational requirements of a job and many other activities. They are easy to observe, quantify and measure. They include items such as certifications, degrees, job titles, technical know-how, and technical and administrative procedures in general. At the end of this module each learner should be able to:

1. Deal effectively and politely with people, which can determine the professional success of an individual and lead to the overall success of an organization or institution.
2. Learn the general principles about the soft skill, e.g. definition, characteristics, fundamental aspects
3. Learn the role of the soft skill in engineering profession: it must be said that, along with hard skills, engineers need a firm foundation in the field of the soft skills too; the engineer is a person who works in contact with many people, therefore, soft skills (e.g. communication, flexibility, interpersonal relationship, positivity and the other topics discussed in the module) play a significant role;
4. Learn the role of the soft skill in learning activities and, particularly, in engineering education.

Contents

1.Introduction 6
1.1General Definitions 6
1.2 Origins 6
1.3 Characteristics of Soft Skills 7
1.4 The Soft Skills in Engineering and Engineering Education 9
1.4.1 Phases of Engineering 9
1.4.2 The Soft Skills as Part of Engineering 4.0 9
2. Communication 11
2.1 Introduction 11
2.2 The Basic Rules of Communication 12
2.3 Components of Communication 14
2.4 Factors that Impair Effective Communication 15
2.5 The Question Game 16
2.6 Communication Channels 16
2.7 Attitudes 18
2.8 Neuro-Linguistic Programming 20
2.9 Intercultural Communication 22
3. Courtesy 26
3.2 Courtesy in Daily Life 26
3.3 Courtesy in Engineering 26
3.4 Courtesy in Teaching 27
4.Flexibility 28
4.1 General Principles 28
4.2 Daily Life 30
4.3Engineering 30
4.4 Teaching 32
5. Ethics and Integrity 34
5.1 Some Definitions 34
5.2General Criterion to Determine a Specific Deontology 36
5.3 Use of a Determined Deontology 38
5.4 Some Examples of Ethics 39
5.4.1 Introduction 39

5.4.2 The Base of Roman Ethics 39
5.4.3 Ethics in the Engineering Profession 39
5.4.7 Ethics of the Engineering Teacher 40
6.Relation with Others 44
6.1 Interpersonal Relationship 44
6.2 Positivity 45
6.3 Professionalism 46
6.4 Responsibility 47
6.5 Teamwork 48
6.7 WHY ORGANIZATIONS BUILD TEAMS 49
6.8 FACTORS IN EFFECTIVE TEAMWORK 49
6.9 GROUP COHESIVENESS 49
6.10 GROUPTHINK 50
6.11 WHY TEAMS FAIL 50
6.12 THE TEAM AND ITS MEMBERS 51
6.13 WHAT SKILLS DOES THE TEAM NEED? 51
6.14 WHAT ROLES DO TEAM MEMBERS PLAY? 52
6.15 CLASS TEAM PROJECTS 52
6.16 Empathy 53
6.16.1 Signs of Empathy 53
6.16.2 Types of Empathy 53
6.16.3 Empathy vs. Sympathy vs. Compassion 54
6.16.4 Uses for Empathy 54
6.16.5 Potential Pitfalls of Empathy 54
6.16.6 Impact of Empathy 54
6.16.7 Barriers to Empathy 55
6.16.8 Cognitive Biases 55
6.16.9 Dehumanization 55
6.16.10 Victim Blaming 55
6.16.11 Causes of Empathy 56
6.16.12 Neuroscientific Explanations 56
6.16.13 Emotional Explanations 56
6.16.14 Prosocial Explanations 56

6.16.15 Tips for Practicing Empathy 56
6.16.16 A Word From Verywell 57
6.17 Engagement 57
6.18 Leadership 58
7.Relation with Himself 63
7.1 Learning to Learn 63
7.2 Problem Solving 65
7.3 Digital Thinking 66
7.4 Planning 66
7.5 Result Orientation 67
7.6 Awareness 68
7.7 Personal Branding 70
8.Imagination and Creativity 74
8.1 Introduction 74
8.2.General Steps 74
8.3 Daily Life 75
8.4 Engineering 75
8.4.1 Historical Heritage 75
8.4.2 Traditional Heuristic Methods 76
9.Human Aspects of Technology 84
9.1 Preliminary Concepts 84
9.2 Ethical Issues 84
9.3 Positive Aspects of Technological Progress on Mankind 85
9.4 Negative Aspects of Technological Progress on Mankind 85
9.5Technological Development and Environment 86
10. Talent Development 92
10.1 General Principles 92
10.2 The Development of Talent 96
10.3 Daily Life 98
10.4 Engineering 99
10.5 Teaching 99
11. References 103

1. **Introduction**

1.1 **General definitions**

Each profession requires the specific knowledge and competencies necessary to perform the relative tasks. Such knowledge and competencies, called skills, can be considered as being divided in two broad categories: Hard Skills and Soft Skills.

Hard skills are the technical/professional competencies, that can be acquired through study and tested through exams; Examples of hard skills include the ability to formalize a function performed by a technical system; the ability to manage a given software; the ability to calculate the mechanical stress in a given part of a machine; the knowledge of foreign languages; and the ability to utilize/operate machines and devices.

Soft Skills, instead, are personal competencies, related to human personality. They are more difficult to be taught and tested. But they are very important, not only in the Engineering field, but also in all professional fields as well as in everyday life.

In fact, Soft Skills are related to human behavior, in all fields of activity: behavior in relation to human beings and to the specific environmental situation. Examples of Soft Skills include the ability to communicate, imagination, leadership, ethics, and the ability working in a team.

1.2 **Origins**

Soft Skills concept is a very recent discovery, but some ideas of "soft" competencies appeared many centuries ago. The first steps in the development of Soft Skills are, therefore, to be found in the history. For example, the ancient Greek philosopher Aristotle says that efficient communication should be based on three pillars: ethos (ethics), pathos (emotion) and logos (logical rigor). Another very important Greek philosopher, Socrates, claims that the basis of communication is the truth search criteria: the teacher helps the student to bring out the truth. Many centuries later, the very well-known sentence by Erasmus of Rotterdam (1466–1536) "the best ideas do not come from reason, but from a lucid, visionary madness" is a primordial idea of Soft Skills. In this sentence the idea that reason is very important is clear, but there is something in addition to reason which can make the behavioral difference. Furthermore, the well-known French philosopher, Blaise Pascal (1623–1662) [2] recognized two fundamental forms of knowledge, starting from different assumptions, one proposing an esprit de geometrie and the other an esprit de fnesse (spirit of geometry and spirit of intuition). Pascal distinguished, in an initial form, the implicit concepts of hard and soft competencies, and highlighted the important role of the "soft". Pascal says that the spirit of geometry is not enough to completely understand reality, because it is not able to get to the foundations of the human being. Each science, without consideration for the human being is, in Pascal's opinion, not useful in general. However, the spirit of intuition, without spirit of geometry is weak and fails to descend to the deepest and truest principles of the human being.

Consequently, the spirit of intuition and the spirit of geometry are both equally necessary for complete knowledge and, ultimately, for a complete human being.

Therefore, based on the integration of the two "spirits", Pascal's thought contains an embryo of the concept of "Intellectual Fusion", that will be a fundamental aspect of soft skills.

1.3 **Characteristics of soft skills**

Nowadays knowledge of soft skills is particularly important during recruitment processes. As observed above, while it is easy to upgrade hard skills, it is not, in a similar way, easy to upgrade soft skills. Consequently, problems in teaching soft skills can produce problems in the integration of the competencies and, consequently, in team working.

In this module, the soft skills listed below are dealt with:
With reference to point **Talent Development** of particular interest and use is the anticipation of some considerations about the link between hard/soft skills and the parts of the human brain. Hard skills (HS) are related to the left part of the brain and are linked to the Intellectual Quotient (IQ), while the soft skills (SS) are related to the right part of the brain and linked to the Emotional Quotient (EQ). The integration of IQ and EQ has IF (Intellectual Fusion), as a result:

IQ × EQ = IF, requirement for each professional to achieve the "role" of "difference maker".

Another interesting analytical relation is as follows: IF × XQ = QS, quotient of success

where XQ is the ability in communicating difficult content in a soft way (important part of the soft skills) and QS means the quotient of success (a complete personality, with great Intellectual Fusion, can reach a high possibility of success).

The following link will allow you to evaluate your prevailing percentage of the right or left hemispheres. https://www.arealme.com/left-right-brain/en/

The soft skills considered in this module are the following:

Communication capability, based on verbal, non-verbal and ability to listen. The ability to structure each transmission of information (particularly, but not only, technical) by applying the following steps:

i. Identification of the receiver's initial knowledge of the communication (starting point) by considering the hard and the soft components
ii. Identification of the upgrading of knowledge to be attained by the receivers of the communication (arrival point) by considering the hard and the soft components
iii. Identification of the knowledge to be transmitted (what to transmit) and consequent feedback to be received
iv. Determination of the communication means necessary for the transmission (how to transmit) (e.g. text, voice, picture, by regarding hard and soft components).

a) Courtesy/kindness

- The ability to win the respect of all people you come into contact with.
- Flexibility
- The ability to shift thought and action course according to the environmental changing.

b) Ethics and integrity

- The quality of being honest and of having strong moral principle

- The state to consider that technical products could cause damage to their users in some cases (honesty in engineering deontology).

c) Interpersonal relationship
- The ability to create a pleasant social commitment
- The ability to realize good relationships with everybody

d) Positivity
- The ability to be optimistic and to transmit optimism to colleagues.

e) Professionalism
- The ability to behave in a way that is congruent to the requirements of the specific work/social environment
- The ability to update professional knowledge, in relation to the change of the market's/environment's requirement.

f) Responsibility
- Self-discipline and conscientiousness

g) Teamwork
- The ability to cooperate and to contribute so that all members of the team perform the required task.

h) Imagination and creativity
- As said by A. Einstein "imagination is more important than knowledge. Knowledge is limited. Imagination encircles the world".

i) Awareness
- How to develop self-knowledge and self-evaluation skills.

j) Human aspects of technology
- A clear idea that technology is for the mankind and not mankind for technology
- The ability to evaluate positive and negative effects of technical products on the user

k) Talent development
- The ability to reach a complete personality by a balance between the intellectual quotient and the emotional quotient: the result will be intellectual fusion.

In addition to soft skills listed above, it is important to include the following

i. Empathy- Understand the feelings of others, step into their shoes, interpret their behaviors
ii. Engagement- Involve others in sharing new ideas and new initiatives, emotional commitment in being engaged
iii. Learning to learn- Powerful mental tool stimulating motivation and desire to acquire new knowledge and know-how in order to update and implement personal and professional experience
iv. Problem solving- It is all about using logic and imagination to recognize problems, analyze them and define targeted strategic solutions
v. Digital thinking - Develop awareness of the opportunities offered to people with digital mind-set to understand the world and believe in the power of data

vi. Leadership - Inspire and have a positive influence on the people behavior by channeling their focus to system objectives
vii. Planning- Study and identify the effective results that make up the objective, and activate means and methods to achieve them
viii. Result orientation - Focus on outcome rather than process used to produce a product or to deliver a service
ix. Personal branding - Questionnaires aimed at determining the subject's know-how related to Soft Skills

The soft skills, therefore, in addition to the hard ones, harmoniously complete the personality of the engineer, like any other person, who thus has the opportunity to become a "difference maker".

1.4 The soft skills in engineering and engineering education

1.4.1 Phases of Engineering

It is useful to recognize the following phases of engineering development:

a) Engineering 1.0 (up to 1970), characterized by Mechanics and Electricity.
b) Engineering 2.0 (1970–1995), characterized by Electronics, Automation and Informatics.
c) Engineering 3.0 (1995–2015), characterized by integration of Electronics, Automation and Informatics
d) Engineering 4.0 (since 2015), characterized by a great development of Electronics, Automation and Informatics, by innovative disciplines, such as, e.g., integration of different scientific-technical fields, virtual and augmented reality, nanotechnology, biotechnology, biomimetic, additive manufacturing, design science and, among many others, soft skills.

The Soft Skills quickly became an important part of the above-mentioned engineering phases and are the main purpose of this module.

1.4.2 The soft skills as part of engineering 4.0

Engineering 3.0 required great hard competencies: technical schools and Universities focused on giving students the above mentioned, competencies and graduate engineers in general had a very good education for performing the required activities, but, in general, their preparation, from the point of view of the soft skills, was not very good. In the Engineering 3.0 period, the requirements of "soft" competencies began: e.g. a team working relationship began to have more and more importance. In the same way, e.g., the communication requirements became ever more important. Therefore, soft skills attained the role of being an important part of Engineering 4.0.

Review questions

1) Discuss the difference between hard skills and soft skills
2) Discuss the fundamental aspect of soft skills
3) Discuss the Intellectual Fusion
4) What are the steps to consider while transmitting information to the receiver discuss
5) Discuss the phases of engineering development

Multiple choice questions

1. Which one of the following is soft skill

   a) the ability to formalize a function performed by a technical system
   b) the ability to manage a given software
   c) the ability to calculate the mechanical stress in a given part of a machine
   d) the ability to utilize/operate machines and device
   e) the ability to communicate, imagination, leadership, ethics, and the ability working in a team.
2. It is easy to upgrade hard skills but not easy to upgrade soft skills.
   a) True b) False
3. Hard skills (HS) are related to the left part of the brain and are linked to the Intellectual Quotient (IQ), while the soft skills (SS) are related to the right part of the brain and linked to the Emotional Quotient (EQ)
   a) False b) True
4. The ability to win the respect of all people you come into contact with
   a) Flexibility
   b) Ethics and integrity
   c) Courtesy
   d) Positivity
5. Which one of the following statement is not true
   a) Technology is for the mankind and not mankind for technology
   b) Evaluating the positive and negative effects of technical products on the user is important
   c) Technology is for the mankind and mankind is for technology
   d) none

   Answer
   1. E 2. A 3. B 4. C 5. C

Chapter Two

2. Communication

2.1 Introduction

One statement is particularly significant to discuss the topic: To understand himself, man needs to be understood; to be understood, he must understand. Human beings, all of them, interact by communicating. The word communicate comes from the Latin Communis agere, or Put in common.

Indeed communicating means transferring a message in a way that allows the person receiving it to interpret it, attributing the same meaning the message has for the sender. This aspect presents quite a problem, if we consider that communication features three basic axioms:

1. There is no non-behavior, as behavior is, in fact, the ***basis of human relationships*** and, therefore, it is, itself, the basis of interpersonal knowledge
2. Non-communication is impossible, as every behavior is, in fact, a communicative message
3. It is ***impossible to avoid influencing others***, as every form of communication has an effect on the individual's perception of reality

One must keep in mind that, what is important in a communication process is not what we say ***but how we say it***, how we are listened to, how we are understood, how we are interpreted, how we are remembered and, finally, how our interlocutor reacts to this.

The communication process is like an **iceberg** (Fig. 2.1): we are ***accustomed to only seeing*** the part above the water line, and we either do not see, or underestimate, the submerged part, which is actually more important and significant.

Fig. 2.1 The communication iceberg

The apex (or referring to the image, the tip of the iceberg) constitutes verbal and written communication. The "submerged" part represents non-verbal communication, in other words facial expressions ("face"), body movements, clothing, proxemics, the ability to listen and neuro-

linguistic programming (NLP). Non-verbal communication is a predominant part of communication.

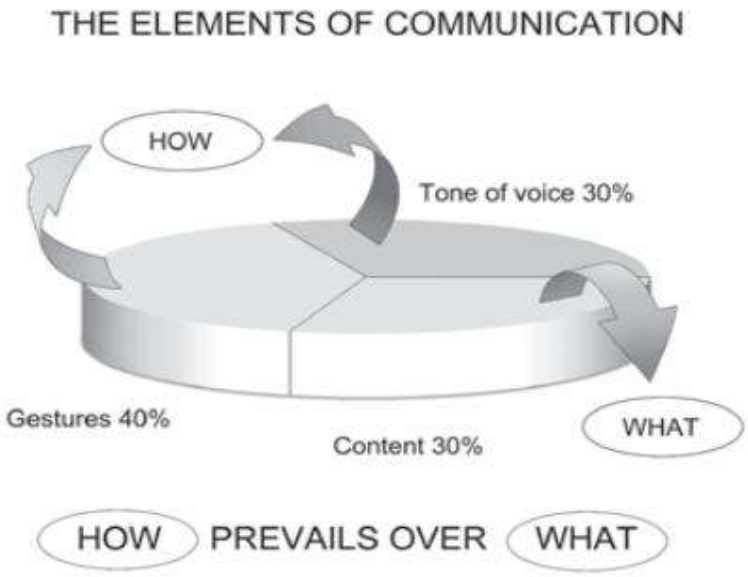

Fig. 2.2 The "how" of communication takes precedence over the "what"

From Fig. 2.2 We must also observe how the combination of gestures and tone of voice makes up 70% of communication. In other words, the "how" of communication over the "what".

2.2 The Basic Rules of Communication

"Personality" plays an important role in communication: it is the result of several factors, some of the most important of which are listed below:

- Personal history
- Behaviors
- Motivation systems
- Feelings
- Culture
- Context
- Status
- Psychosocial roles
- Values
- The Unconscious.

It must then be said that the process of understanding the meaning of communication unfolds through the following factors:

1. The filter, or the complex system of values that belongs to each individual; subsequently, each person can choose certain elements of communication and discard others
2. The halo effect, related to the fact that a word or an idea can trigger personal associations and can, therefore, either hinder or help communication, depending on the links triggered.

Figure 2.3 represents information between two people. It is interesting to observe the following. If the theoretical content of communication is 100, then what is effectively said is 70, while we receive 40, understand 20 and remember 10. Hence, every communication presents a strong deterioration between what the person communicating wants to communicate and what the receiver later remembers.

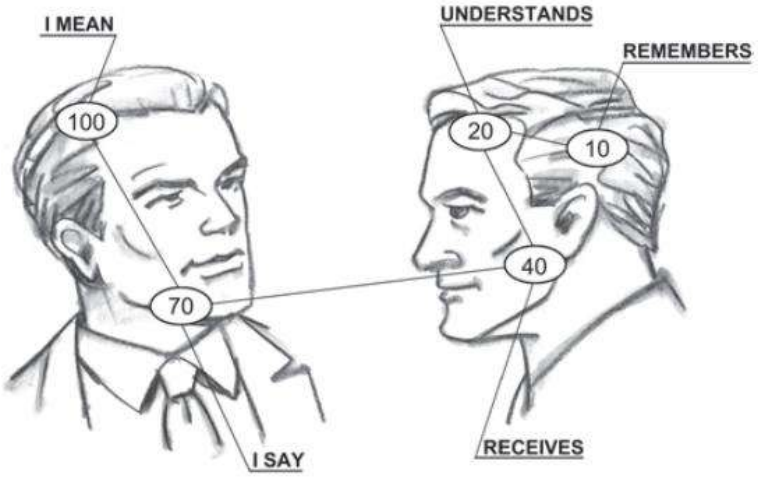

Fig. 2.3 "Deterioration" of communication"

The basic elements of communication are listed below:

a) Source: the person communicating
b) Recipient: the person receiving the communication
c) Message: the content of communication
d) Coding: the link between the content intended by the source and the system of signs used (e.g., written or spoken words and images)
e) Channel: the path (e.g., visual or auditory) through which communication happens
f) Decoding: the reverse of coding, in other words, the recipient's perception of the sign system and the reconstruction of the content intended by the source (obviously, minus the deterioration exemplified in Fig. 2.3)
g) Feedback: the recipient's "response" to what he understands of the communication (it is basically the verification of communication)
h) Context: everything that surrounds communication.

Figure 2.4 exemplifies the above.
The source structures the content he wants to convey and "assigns" it to a system of signs (written words, spoken words orimages) transferred through a physical medium.

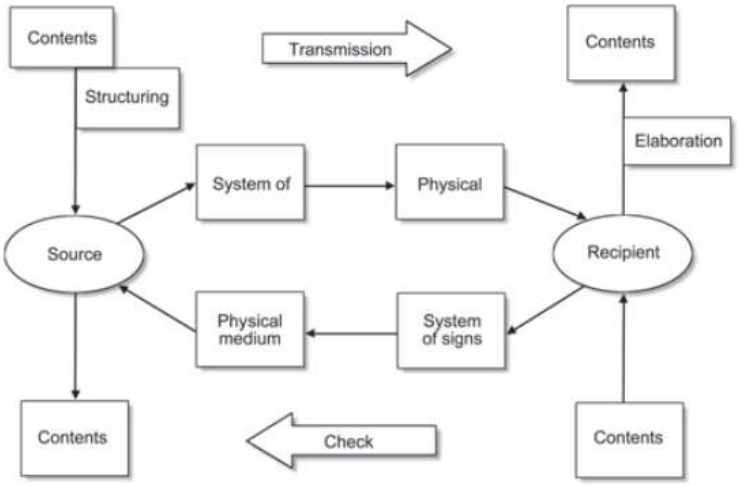

Fig. 2.4 Logical diagram of communication

The recipient receives the system of signs through the physical medium and reconstructs the content, obviously keeping in mind the "deterioration" exemplified in Fig. 2.3.
During check, which is the feedback of communication, the recipient transfers the content to the source through a system of signs and a physical medium.

2.3 Components of Communication

The main components of communication are generally the following:

a) Content that is communicated
b) The context in which the communication takes place
c) The relationship that develops between the interlocutors.

The ability to listen is extremely important. It is essential to listen in order to communicate well. But this also depends on how we listen, as listening can be: passive, attentive, active or empathic. It is passive when we only hear the sound of the voice. It is attentive when we grasp the rational meaning of the words and sentences. It is active when we look beyond the words and perceive what lies behind them (voice-tone-attitude). It is empathic when we give the person speaking "psychological space", in other words, when we make him feel he has an open "space" to delve deeper into feelings, show emotions and feel understood without being judged.

Hence the importance of differentiating between: Hearing, characterized by:

a) Passive attitude
b) Selective hearing
c) Rapid elimination of what is heard
d) Lack of interest
e) Lagging conversation
f) Various noises
g) Anonymity.

Listening, characterized by:
Focusing

a) Absorbing

b) Interpreting
c) Being involved
d) Understanding and retaining
e) Forming an opinion
f) Attributing emotions to the content.

In other words, knowing how to listen is an art. Some guidelines to best develop this art are the following:

- Do not be hasty in drawing conclusions. Conclusions are the most ephemeral part of communication
- What we see depends on our own point of view. In order to see correctly, we need to change our point of view
- If we want to understand what someone else is saying, we need to assume that they are right and ask them to help us see things and events from their perspective
- Emotions are fundamental cognitive tools, if we know how to understand their language. They do not tell us about what we see, but of how we see: their code is relational and analogical
- A good listener welcomes the paradoxes of thought and communication. He considers disagreements as opportunities to practice in a field he enjoys: he knows how to creatively deal with conflict
- Moreover, a certain sense of humor is not a bad thing when listening.

2.4 **Factors that impair effective communication**

In terms of deterioration in communication (Fig. 2.3), factors that can be an obstacle to good communication are grouped by whether they are generated by the sender or by the receiver:

(a) Source:

- Stress and worry
- Emotional block
- Hostility
- Distraction
- Memory of past experiences
- Stereotypes
- Physical environment
- Tone of voice
- Mental noise
- Distractions
- Hasty communication
- Length of message
- Use of slang terms.

(b) Recipient:

- Wrong interpretation
- Lack of understanding
- Excessive effort in other activities
- Differing meanings attributed

- Boredom.

2.5 **The question game**

The essence of good communication lies in talking with someone and not in talking at someone. Moreover, the best way to talk "with someone" is to ask questions. Neutral questions that are not aimed at producing any specific emotional response can be divided into closed questions, which elicit only two types of answers: YES or NO. We, therefore, use closed questions to clarify, to affirm, to summarize and to confirm. Open questions start with who, How, What, Where, When, Why. We use them to gather information, invite dialogue, engage both parties, start a relationship, and to better understand. The advantage of knowing how to ask questions can be traced to the following: we obtain and give information, we develop relationships that relax and boost confidence, we give value to the interlocutor, we gain control over the situation, and we obtain greater detail. To show that we have carefully prayed attention and to give the interlocutor a sign of motivation, it can be useful to use some connecting expressions before moving on to questions (i.e., of course, very well, I am sorry to hear this, let's go over the main topics of what you are saying...). It is also essential to know how to reword, or concisely repeat what the person has said, in order to allow us to respond to the topic by showing attention, respect and interest for what our interlocutor is saying:

- If I am not mistaken, you're telling me that
- So according to you
- So recapping
- You're saying that

2.6 **Communication channels**

Communication channels are summarized in Table 2.1. It is also important to identify the efficiency and effectiveness of communication (Table 2.2). They are strictly connected to the same channels. The "Verbal" channel includes the content and the structure of discourse. The content relates to the informative aspect, which can reveal either facts or subjective elements, show constructive, destructive or blackmailing traits, be vague or precise. The structure is determined by the subject's intentions towards the interlocutor: issue orders or make requests, investigate or walk away. The skill to continuously scan the dialogue can also be included in this area: respond in kind, interrupt or let the other person talk.

Table 2.1 Communication channels

Verbal	(a) Be intelligible: speak the same language (b) Ask stimulating questions: to encourage refection and understanding (c) Be impactful: to prevent others from forgetting
Tonal	(a) Vary the pitch: to increase persuasion (b) Know how to pause: to show confidence (c) Underline: to highlight a specific, important item
Non-verbal: body	(a) Body language: to show mastery (b) Presence: appearance is what makes the first impact (c) Self-projection: to give impetus
Non-verbal: gestures	(a) Controlling gestures: gestures help us communicate (b) Facial expressions: to strengthen the message

	(c) Visual contact: seeing means involving

Table 2.2 Efficiency and effectiveness of communication

Efficiency	Effectiveness
Presence	Have a clear idea of what you want to say
Initial silence	Adapt your own style to that of the interlocutor
Initial question	Do not speak quickly (pauses help both the speaker and the listener)
Use silence	Do not be verbose
Gestures	Try to be practical
Eye contact	Change the tone (do not be monotonous)
Emphasis	Show that you value the interlocutor by referring to his Knowledge
"Us" form	Look into the eyes

The "Tonal channel" includes the tone and rhythm with which the verbal elements are emitted. The tone refers to the pitch and intensity of the voice. Thus, a person can talk in a high or low-pitch, determined or undefined way that can be either devoid of variations or emphatic. Rhythm concerns speed and frequency: it is possible to speak quickly or slowly, fluently or in bursts. To this, we can add the sound expression, which involves all further sounds apart from words, such as sighs and coughs. The "Non-verbal" channel, commonly defined as "body and gestures language" (body movements and gestures), includes the areas described below: gestures, posture and proxemics.

Mimicry: the combination of facial expressions, movements of the head and manifestations, such as turning pale or blushing. The gaze, a powerful communicative skill, also belongs to this category.
Gesticulation: the movement of arms and hands.
Posture: the position adopted by the body, which can be leaning forward or backwards, standing upright or curled up. It includes the relationship with the position of the interlocutor: facing, sideways or diagonally. Proxemics refers to space and distance as a factor of communication. Figures 2.5, 2.6, 2.7, 2.8, 2.9, 2.10 and 2.11 show examples of non-verbal communication.

Fig. 2.5 Examples of facial expressions

Fig. 2.6 Examples of stress

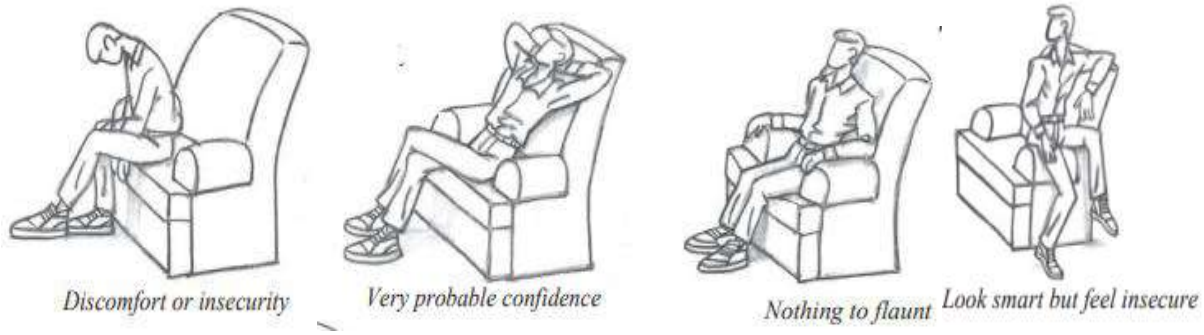

Fig.2.7. Examples of postures

2.7 **Attitudes**

Attitudes can be defined as mental states, which have been created over time and which dynamically influence the individual, preparing them to react in a specific way to certain situations. They manifest not only in verbal communications but in all expressive situations, and underpin our way of relating to the environment. From the perspective of interpersonal relationships, attitudes are permanent predispositions to act in a certain way. Attitude is the key to success. This expresses the mental condition concerning what happens, or simply the way of seeing things. Some important items concerning attitudes are listed below:

- The mental attitude affects our behavior: it is not always possible to mask our feelings towards the interlocutor
- Attitude determines the level of job satisfaction
- Attitude influences anyone coming into contact with us
- Attitude is not solely reflected in the tone of voice but also in the physical posture of the body, in the facial expressions and in other types of meta-language
- An attitude is never static or unchangeable: it is up to us to decide the most appropriate attitude for the situation
- It is important to start the day by thinking of the positive aspects of the job, connection, meeting and so on.

In unpleasant situations, we should focus on the positive side of things and on the activities that allow for an appropriate sense of proportion. If at all possible, it would be appropriate to

avoid quarrel some people and conflict situations. It is also important to share our positive feelings with others when things are going well: the attitude is “contagious”.
The relationship is born within the communication process, which first of all means reading the interpersonal dynamics at hand and adopting a style of communication that is consistent with the environment, possibly oriented to the interlocutor (empathy) and aimed towards the objective of the communication itself.

The main communication factors—from which the behavior depends—have different ratios as indicated in Fig. 2.2.

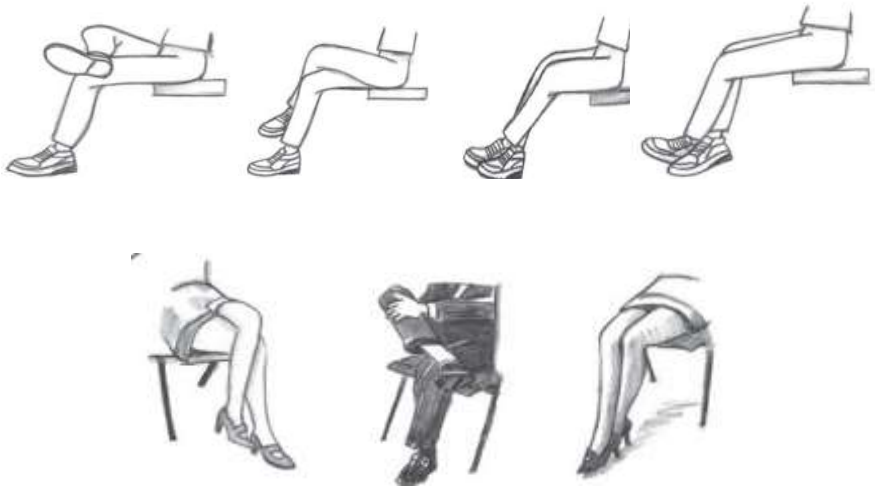

Fig. 2.8 The crossing of legs involves many variations, which have as, a common element, the closure towards the outside.

Fig. 2.9 Examples of handshake (social zone)

Hence the need to choose the appropriate communication channels. The following steps are interesting:

- Step 1 is authenticity: understanding who we are, showing this to other people, which turns into communicating our own values to make them understandable, sharing them and using them to guide ourselves (such as, for example, internal clarity, sharing, motivation, drive to take action, constant reinforcement of intangible assets, the basis for evolution and development)
- Step 2 is clarity: the message must be simple
- Step 3 is continuity: communication must not be interrupted

- Step 4 is credibility: communication must occur in a climate of trust as the source must be acknowledged as valid and reliable.

Fig. 2.10 Examples of crossing arms

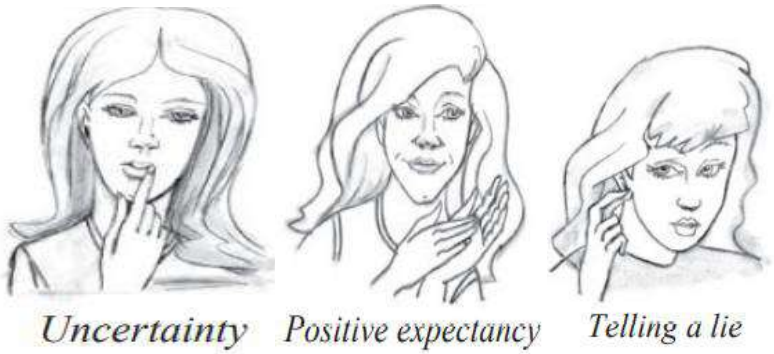

Fig.2.11. Examples of Gestural communication

Communication rationale can be derived from the level of fusion between the "facts" dimension and the "personal opinions" and "feelings" dimensions. Therefore, a message should be structured as follows:

- ✓ **F (facts) O (opinions) E (emotions) = FOE**

Identifies descriptive communication, where the main principle is not to pollute facts with interpretation data; it responds to the need to place the interlocutor before a neutral message, which we know will be interpreted. It is "Rational Communication" oriented towards a solution to problems and group decision-making.

- ✓ **(opinions) F (facts) E (emotions) = OFE**

It identifies generally coercive communication that, taking advantage of sentimental aspects, places the interlocutor before interpretational data.

- ✓ **E (emotions) O (opinions) F (facts) = EOF**

It identifies basically manipulative communication aimed at influencing the interlocutor on an emotional level, playing with the more essentially relational and empathic aspects.

2.8 **Neuro-linguistic programming**

Neuro-linguistic programming (NLP) is based on certain specifc topics, which can be attributed to the following factors. Neuro: refers to our nervous system. The crossroads of our five senses: sight, hearing, touch, taste and smell. Linguistic: refers to our ability to use language, and how our words and sentences reflect our mental world. Moreover, it also refers to our secret language of posture/gestures and habits, which reveal our thoughts, our beliefs or, in one word, our "Self". Program: our way of thinking, our feelings, and our actions are habitual programs we can change by improving our "mental software".
Of the 5 senses, those most in use in NLP communication are:

- Sight (V)
- Hearing (A)
- Touch (K)

Ultimately, human beings can be divided into three categories:

- "Visual", if they are mainly sensitive to shapes, colors, and movements
- "Auditory", if they mainly pay attention to sounds, noise and word
- "Kinesthetic" if they are predisposed to grasping taste, smell and touch-related aspects of their environment.

Each of us has a more developed sense, compared to others, which we use to represent reality.
According to the above, our reactions lead to facial expressions that, if correctly interpreted, can change our interlocutor's reaction. The category we belong to can be recognized by the words and the gestures we most commonly use. In fact, each of us tends to preferably use and perceive some words, compared to others. Regarding the senses, smell and taste are, for example, less developed among Westerners, compared to other populations. Hence, attention should not only be placed on the words of our interlocutor, but also on what their body is subconsciously telling us. With a little attention and practice, they will reveal the interlocutor's sensory channel.

If, for example, they look up while we are talking, they are telling us that they are "visually" representing what we are saying. If, on the other hand, their gaze moves downwards to the right, if they sigh deeply, if they caress the desk top or touch or weigh up the objects around them, their body is telling us that their most predominant sense is "kinesthetic". If, however, every now and then they interrupt themselves and listen to sounds or noises coming from the next room, or if their gaze moves horizontally to the right and to the left, if, when they are listening to us, they perch their head on the palm of their hand with their head slightly tilted, as if they were making a call, or they stroke their chin or touch their nose or ears or areas of the mouth, they are telling us that they are on the "auditory" channel.

If the sense of "sight" is prevalent in our interlocutor, we can invite them to clarify their thoughts: let us show them our point of view with words evoking colors, nuances and movement. We can show them documents, graphs, photographs and images to support what we are saying, so that they can form a picture of the situation that is as clear as possible. If they are mostly "auditory", we can ask them to listen carefully to what we are saying, in order to better and more quickly harmonize our objectives and our actions. Finally, if they are mainly "kinesthetic", we can try to shake them up, having them touch the advantages of our proposal, something which will make them more confident and more at peace in future situations. Recognizing and discovering to which of these three classes our interlocutor belongs is very important, and it allows us to choose words, adjectives, verbs, adverbs which case by case will make our messages

come across more clearly and directly.' If, independently from the prevalent perceptive channel, we switch on all our senses, our messages will be better received and remembered for a longer time. Therefore, let us learn to refine our perceptive abilities.

2.9 **Intercultural communication**

The cultural background of an individual is very important for his communication. Indeed, a very important element is the cultural profile of a person. It is, essentially, constituted by family, religion, education, culture, profession, social class, gender, ethnic background, generation, neighboring countries and social relationships. It is crucial to identify the dominant orientations in a culture and, at the same time, to pay attention to the variations and the changes, which characterize the individual. Every culture is oriented and has specific preferences such as, for example:

1. relationship with the environment (control/harmony),
2. Relationship with time (polychromic/monochromic, rigorous/vague, past/present/future),
3. Relationship with oneself (being/acting),
4. Style of communication (very contextual/not very contextual, direct/indirect, expressive/instrumental, formal/informal),
5. Relationship with space (private/public),
6. Relationship with power (hierarchy/equality),
7. Relationship with individual group (individualism/collectivism, universalism/particularism),
8. Relationship with others (competition/collaboration),
9. Need for structure (order/fexibility), way of thinking (deductive/inductive linear/systemic).

It must also be kept in mind that cultures change and evolve based on events and on the various changes in the macro-environment. The main factors, which determine them, can be mostly traced back to the following (E.S.T.E.M.P.L.E.):

- Economic
- Social
- Technological
- Ecological
- Media
- Political
- Legal
- Ethical.

The mechanism of "intercultural" perception is also important, for example: Ethnocentrism: we think we are at the center of the world Resemblance: we think others think the way we do
Interference: we only see what we want to see Projection: we project our unmet desires onto others. Cultural difference factors are also essential in communication/negotiation, such as for example:

1. The way you lead relationships
2. Assessment of time
3. The form of communication
4. The weight of hierarchy
5. The consideration of status
6. Group dependency

7. Acceptance of differences
8. Adaptability to change.

What is considered a correct behavior in our country might be seen as the contrary in others. So, besides learning the rules of business itself (Hard Skills), we also need to know, on top of language, the culture (Soft Skills). We must, for example, consider the structure and the meaning of hierarchy. A strongly hierarchical culture tends to put "everyone in their place", and considers "changes of status" as something that will happen rarely and slowly. Addressing a subordinate by skipping the direct superior is greatly offensive. The time factor is also very important. For example, in Western cultures it is generally considered as precious resource, which must be used sparingly, while in other cultures (Far and Middle East) it is, at times, a more elastic concept, which is less important, compared to other elements of social coexistence. To this end, it is interesting to see how time is considered in various cultures (Table 2.3). We can therefore state that in general "hard skill" don't change very often, while "soft skill" may change continuously.

Table 2.3 The concept of time in various cultures

Polychromic (Common in Latin countries, in Southern Europe, in the Mediterranean and in Japan)	Monochromic (Popular in Germany, Northern Europe and North America)
Multiple activities are carried out at the same time	One thing at a time
Interruptions and changes of activities are accepted	We devote ourselves totally and exclusively to the task at hand
We communicate by referring often and extensively to the context	We communicate without referring to context or not often
Relationships between individuals are more important than achieving the result	The execution of the project or of the task at hand has a higher priority compared to relationships with other individuals
Plans and projects are easily and often modified	An established programme is followed scrupulous
Priority is given to people who are emotionally close to us	An effort is made not to disturb other people. Confidentiality and discretion are the rule
Exchanges and lending of personal objects are common and well accepted	Property is well defined. We lend something only if we are forced to do so
Punctuality is quite relative	Excessive punctuality
Polychromic (Common in Latin countries, in Southern Europe, in the Mediterranean and in Japan)	Monochromic(Popular in Germany, Northern Europe and North America)
Relationships are stronger and more Lasting	Relationships are more superficial and short- lived
People are impatient and tend to move straight to action	People are slower, more methodical and less involved
Binding commitments worry people	The most binding commitments are

	the ones based on time, date and duration

Multiple choice questions

1. Communication is a non-stop_____.

a) Paper b) process c) programme d) plan

2. Communication is a part of _____ skills.

a) Soft b) hard c) rough d) short

3. The _____ is the person who transmits the message.

a) Receiver b) driver c) sender d) cleaner

4. _____ is the person who notices and decodes and attaches some meaning to a message.

a) Receiver b) driver c) sender d) cleaner

5. Message is any signal that triggers the response of a _____

a) Receiver b) driver c) sender d) cleaner

6. The response to a sender's message is called _____

a) Food bank b) feedback c) food d) back

7. _____ context refers to the relationship between the sender and the receiver

a) Social b) physical c) cultural d) chronological

8._____ context refers to the similarity of backgrounds between the sender and the receiver.

a) Physical b) social c) chronological d) cultural

9._____ refers to all these factors that disrupt the communication.

a) Nonsense b) noise c) nowhere d) nobody

10. Environmental barriers are the same as _____ noise.

a) Physiological b) psychological c) physical d) sociological

11. Our dress code is an example of _____ communication.

a) Verbal b) nonverbal c) written d) spoken

12. Communication strengthens _____ & _____ relationship is an organization.

a) employer-father a) employee-employer c) mother-employer d) mother-child

13. _____ communication includes tone of voice body language, facial expressions etc.

(A) Nonverbal (B) verbal (C) letter (D) notice

14. When there is similarity of background between the sender and the receives such as age, language nationality, religion, gender then this is called _____ context.

a) social b) cultural b) physical d) dynamic

15. Letter, e-mail telephone are examples of _____

a) message b) feedback c) channel d) encoding

16.Understanding _____different parts of speech forms the base of leaning grammar

a) Five b) Eight c) Six d) Seven

17.It is of paramount importance that one need to construct a _____sentence in the day to day affairs

a) Wrong b) Correct c) Incorrect d) Night

18. The person who transmits the message is called the ____ or
a) Sender b) Gives c) Taker d) Receiver
19. The information which is transferred to the receiver has to be interpreted this process is called
a) Encoding b) Decoding c) Opening d) Closing
20. All communication events have a _____.
a) Resource b) Source c) Start d) End
21. Personifications of strength and violence are considered as _____ gender.
a) masculine b) Feminine c) common d) Neuter
22.The message may be misinterpreted because of _____
a) Barriers b) Distortions c) Distractions d) Noise
23. The environment in which the transmitter or receiver are should be ____
a) Complex b) Competent c) Complete d) Compatible

Review questions

1) What do we mean by communication, or communicating ?
2) Discuss the three basic axioms of communication
3) What do we mean by influencing others? How we influence others? Why we influence others? discuss in groups
4) In communication process it is not what we say but how we say it that is important. Explain this statement
5) Is verbal or non-verbal communication which is a predominant part of communication?
6) Discuss the factors that affects the process of understanding the meaning of communications
7) Discuss and/or list the basic elements of communication
8) Discuss the main components of communication
9) Discuss the factors that impair effective communication
10) What is the difference between closed questions and open questions
11) Discuss about attitude

Answers

1. B 2. A 3. C 4.A 5.A 6.B 7.A 8. D 9. B 10. C 11. B 12.B 13.A 14.B 15. C 16.B 17.B 18. A 19. B 20. B 21. A 22. A 23. D

Chapter Three

3. Courtesy

How to win the respect of others. It is important not to confuse courtesy with foolish weakness towards our interlocutor: respect, which generates courtesy, is the balance between the fear of one's neighbor, which leads to uncritically accepting everything others either do or say, and arrogance, which leads to prevaricate, systematically contesting every statement of the other. If you want to improve the world, the first step is to improve yourself, and courtesy plays an important role in the process. In this regard, a major obstacle is the excess of ego. This excess can manifest itself in various ways, including:

a) Try to highlight your brilliance, true or presumed, in everyway
b) Continually seek the approval of others
c) Always is defensive.

Knowledge, especially of yourself, is important to get rid of the ego. Albert Einstein said: more the knowledge, lesser the ego, lesser the knowledge, more the ego.

The ego often presents itself as self-confidence, but it is soon recognized as arrogance and, in the end, as insecurity. The ego amplifies information beyond its meaning, selects only what makes our thinking valid, tends to discredit information that contradicts our stand, manipulates information aimed at validating our ideas, and "manufactures" situations, information that never existed. Some ideas for the "cure" of the uncontrolled ego can be traced back to the following:

I. Humility, accepting the principle of ignorance
II. Curiosity, admitting that you do not know
III. Sincerity, recognizing the value of other
IV. Listening skills, attention to others

3.2 **Courtesy in daily life**

As mentioned in the previous paragraph, courtesy is generated by the respect each of us must have for others. Hence, courtesy is respecting others, in other words, not doing to others what we would not like were done to us. In everyday life, courtesy can be attributed to the following consideration. Each of us, in his life, comes in contact with many people every day: it would be important to think that each of our gestures, each of our words, leaves an impression on others, either large or small. Hence, the courteous attitude "sows positivity". Furthermore, it does not hurt to think about mirror neuron theory: our attitudes, in many cases, induce a sort of imitation in others. Our courteous attitude can, therefore, have a beneficial spreading effect like wildfire. The courteous person knows how to be empathic; he steps into others' shoes, understanding their problems and needs.

3.3 **Courtesy in engineering**

The engineer is a person who usually works in contact with other people: customers, superiors, colleagues and subordinates. Hence, courtesy is particularly important. The way one behaves towards others is, in fact, significant to create a harmonious work environment. Very often do we see work environments in which the manager treats colleagues and subordinates with arrogance (if not with downright rudeness). Such an environment is, of course, negative in terms of efficiency and productivity. The considerations made in paragraph 3.2, therefore, also adapt very

well to engineering and, ultimately, to all professions. Courtesy in the professional field costs only a little attention and goodwill, but can yield a lot in terms of work results.

3.4 **Courtesy in Teaching**

A valid way of "teaching" courtesy, may consist in assigning a group, preferably a small one (15–20 people), to carry out a project, allocating a certain time for development. After the time has elapsed, the teacher performs a public discussion, collectively asking for feedback and comments on each possible individual errors.

Courtesy can be "taught" directly by example: the teacher trains students to conduct a "polite" discussion, for example:

i. Not interrupting the speaker and asking to speak before speaking
ii. Making "constructive" and "non-destructive" comments on the work carried out
iii. Avoiding offensive judgments of mistakes made by others
iv. Objectively examining the pros and cons of each work.

By "containing" the arrogant, encouraging the timid and highlighting the general advantages of such an attitude, we can achieve overall enrichment of the group.

Review questions

1) What do we mean by courtesy?
2) If you want to improve the world, the first step is to improve yourself,-explain
3) Discuss some ideas for the "cure" of the uncontrolled ego
4) Why courtesy in engineering discipline? discuss in groups
5) Discuss courtesy in teaching profession

Multiple choice questions

1) Which one is not true about courtesy?
   a) It is not foolish weakness towards our interlocutor b) it is not uncritically accepting everything others either do or say c) it is systematically contesting every statement of the other d) none
2) Which one is the way excess ego can manifest itself :
   a) Try to highlight your brilliance b)to continually seek the approval of others
   b) To be always be defensive d) all
3) Which one of the following is not a cure of the uncontrolled ego

(a) Humility, accepting the principle of ignorance(b) Curiosity, admitting that you do not know(c) Sincerity, recognizing the value of others(d) Listening skills, attention to others

   e) manufactures" situations, information that never existed

4) Which one of the following is not true about courtesy
   a) courtesy is generated by the respect each of us must have for others.
   b) courtesy is respecting others,
   c) courtesy is not doing to others what we would not like were done to us,
   d) Our courteous attitude do not have a beneficial effect
5) Courtesy is important for engineer than teachers as a former usually works in contact with other people: customers, superiors, colleagues and subordinates
   a) True b) False

Answer

1) C 2) D 3) E 4)D 5)B

Chapter Four

3. Flexibility

Ability to adapt to change (i.e. resilience).

4.1 General Principles

Adaptability to change, or flexibility, can be defined as the ability to perceive, in a timely manner, changes in a situation, in a context, in objectives and in moods, in order to rapidly reassess matters and alter the action to be implemented. Flexibility is, therefore, the ability to keep in step with the times for a better future. We often hear the word "resilience", understood as an individual's ability to react to unexpected and sudden situations that are, in any case, objectively considered negative. In this regard, a famous joke by Woody Allen says that the maturity of a person is measured by how they react on waking up in the morning… in their underwear, in the heart of the city! It is, of course, a paradoxical joke but, as is often the case with paradox, it is based on some amount of truth. It is important to notice how the subject's reaction, and consequently their behavior, can (and must) vary in relation to the entity of the change. If this is small, the subject's reaction can be traced to a variation in attitude, born in the mind.

If, however, the change is great, the subject's reaction must come from a variation in paradigm, in other words, in the way they perceive reality. For example, a delayed train (a minor change) can create momentary irritation that, however, can simply mean sitting in a corner and reading a newspaper (variation in attitude).An individual who peacefully reads an interesting book in a corner of a public area is quite another matter. At a certain point, a father walks in with three noisy restless children (a change that is not so minor), whom he ignores. The subject's initial irritation dissipates immediately, turning, on the contrary, into solidarity towards the father, as soon as he finds out that the father was coming from the hospital where the wife was being treated for a serious illness and dead (change of paradigm).If only small changes are desired, then we need to change our behaviors, while if, on the other hand, greater change is the objective, then we must change the paradigms. The current situation is complex and dynamic, characterized by quick and often unpredictable changes. What is valuable today might be valued less in six months, and maybe even less in a year. This consideration further confirms the need to quickly adapt as situations change. The renewal must be carried out in a harmonious way within the four directions that characterize a complete person, precisely: physical, social/emotional, mental and spiritual. An unfortunately common mentality, even today, opposes change. "Why change? We have always done things this way." How often have we heard this phrase repeated to this day, if not the even worse statement, "Everyone does things this way!". Repetition and plagiarism, which are still only too common, hinder a rational and innovative approach. Subsequently, you soon end up being "left behind".

We can also observe, through biomimetic comparison, that animals living a better and longer life are neither the strongest nor the most intelligent, but those, which can better react to change, adapting more quickly to metamorphosing situations. We must, however, be wary of the opposite situation: change for the sake of change, often without realizing why. After a decision is made, we often hear the words "perhaps the other solution would have been better", as the pros and the cons were probably not thoroughly assessed (or not assessed at all!).

Flexibility does not mean constantly changing opinion. It is safe to say that among our acquaintances there are examples of people who take a path and then, before reaching the end of it, shift to another and yet another, which they never complete. This is a "very effective" way to collect disappointments and frustrations, and to waste both time and money. There are, therefore, two types of errors, which relate to two types of people: those who resist change in favor of "nostalgia" ("we have always done things this way"), and those who constantly change ("it might be better to do it this way"). The most balanced people, on the other hand, keep up with progress to create a better future. For those who enjoy paradoxical jokes, it might be worth referring to the typically British masterpiece of paradox, which is the tale of "Alice in Wonderland" and, particularly, to the dialogue between Alice and the Cheshire Cat, portrayed by Walt Disney's drawings:

- Alice: "Tell me which path I must take."
- Cat: "It all depends on where you want to go."
- Alice: "I just want to go somewhere."
- Cat: "Well then, if any path is fine, the important thing is to go all the way."

Indeed, abandoning the chosen path, of course when there are no logical and rational reasons to do so, is a mistake that often carries a high price. We can observe that there are two categories of "things", those which can be changed and those which cannot. Being flexible means being able to distinguish them, having the strength to change the former and to deal with the latter, trying, however, to see the positive sides.

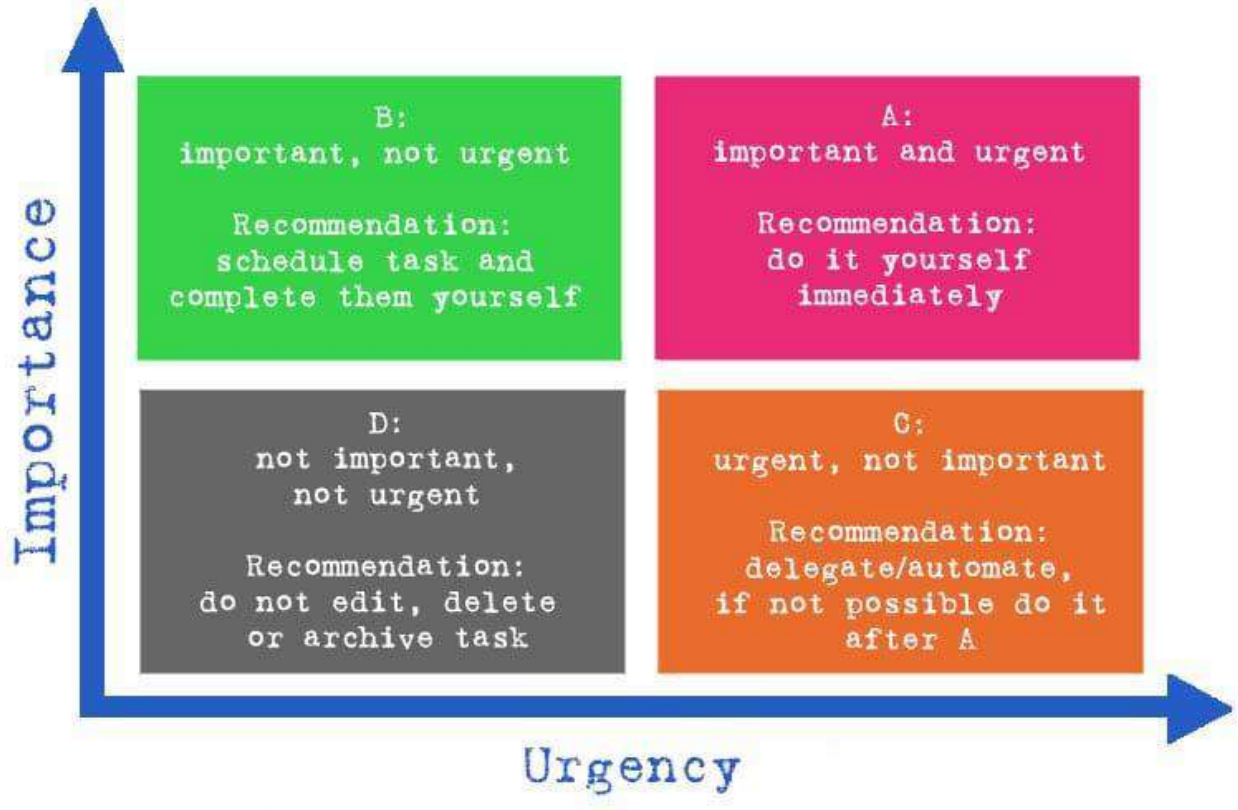

Fig. 4.1 The Eisenhower box/matrix

The Eisenhower matrix can be considered when talking about the ability to make quick decisions in relation to the variationsin context. This box (Fig. 4.1) encourages more rational decisions by classifying the things to do as more or less “important” and “urgent. According to this matrix, things to do are classified based on their importance and urgency. Important and urgent decisions are, of course, the most critical, while the important but not urgent ones are particularly interesting, as they can be thought over and analyzed. Urgent decisions that are not important can be delegated, while non-urgent and non-important ones can be postponed to a later date.

4.2 **Daily life**

In daily life, there are many circumstances in which situations change. Even in many trivial situations, often with no great consequence, each individual has to quickly change plans. Flexibility, therefore, comes into play frequently, even in daily life. It is part of daily experience to see people on the verge of a crisis due to a missed appointment, a delayed train or fight, a change of schedule or any other trite circumstance. A simple example. Just before an important dinner, the owner of a restaurant is informed that the chef will not be present that evening. Rather than panicking, the lady, a knowledgeable gourmet, responds to the challenge by cooking the meal herself: the dinner is a success. A good method to overcome such crises with a flexible approach could be to study them from a broader perspective, almost by applying a temporal “zoom in”. These setbacks and the relative crises are often forgotten after just a few hours, or we might even find out that the event had a previously unimaginable positive outcome. It seems necessary, in this case, to wonder if it was worth it. We could mention the well-known Chinese proverb: Before crying for a misfortune, consider if it is not a blessing. And, conversely: Before rejoicing for a blessing, consider if it is not a misfortune.

4.3 **Engineering**

The engineering profession is very complex and presents several facets. As a rule and with considerable approximation, we can say that engineering is the profession that deals with designing, producing, distributing, using and disposing of technical products. In this sense, we can refer to the product’s lifecycle. The project, which is the result of the designing phase, “shifts” to the production phase, whose outcome is the product. Production can be broken down into two phases: production of parts and assembly. The product, once made, must be distributed. This operation turns it into a product in use. The distribution phase can be analyzed through packing, loading, transport and unloading phases. The product in use starts having the same function that was expressed in the project’s objective. Its use involves performance (which specifically matches the function with the objective’s specifications), maintenance (which keeps the running of functions unaltered or almost so in time, at least to a certain extent), ergonomics (which aims to make the product user oriented), aesthetics (a variably important need based on the type of product), and risk prevention (the need for the product not to cause physical harm to people).

The utilization phase is limited and the product goes out of use. As such, it can either be eliminated and, thus, become waste, or be recovered and become a resource that re-enters the lifecycle of the product itself in some other form. The resource can be a product of the same type as the initial (used) product, a lower level product, a material or a group of materials, or energy.
In all the above phases, the engineers involved must be ready to understand the needs they reveal. A designer, in particular, must be ready to reassess things based on the emerging needs,

initially considering simulations carried out during the design phase, which used virtual reality and augmented reality tools. Subsequently, when the manufactured product is distributed and used, problems and consequent needs might emerge that must be taken into account for the modifications required in the following editions of the product itself. Feedback aimed to modify the product can also emerge for production, distribution, use, and why not, elimination engineers. All engineers must, therefore, have quick reflexes to understand the needs of the market (in other words, of the actual and potential users), and to carry out the necessary corrections.

Engineers are, therefore, among the professionals who must especially be ready to adapt based on changing needs, also of the market, which can be very quick. A very high risk in the industrial world, a risk that was mentioned in relation to the general principles, also involves the engineer's job. It consists in blocking change and innovation with the statement that is repeated only too often even today, "we have always done things this way, why change?. Figure 4.2 is significant, as it shows the importance of companies' ability to change. This is a double entry table, which includes four cells, each of which corresponds to a specific attitude of the company. The horizontal coordinate corresponds to the current level of transformation 4.0, while the vertical one corresponds to the potential for change. Each "cell" corresponds to the type of company.

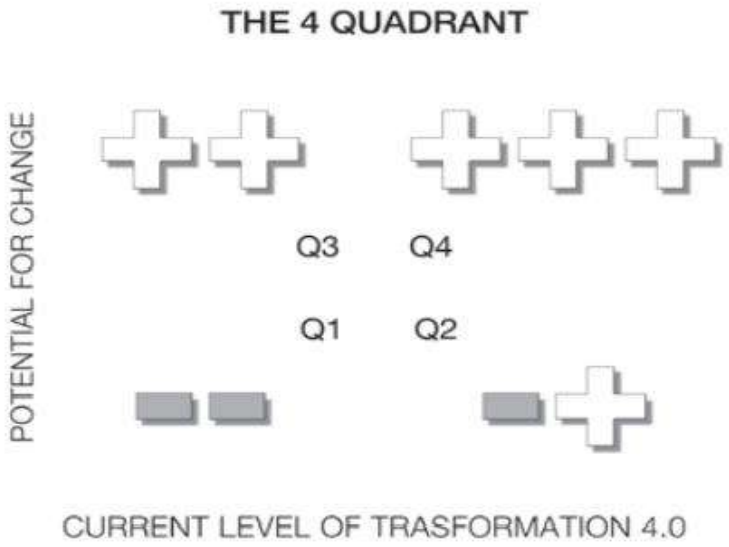

Fig. 4.2 A company's potential for change versus the current level of transformation 4.0 change in the Porter's value chain from push to pull

Q4: the potential for change is high and they are "in movement" in terms of current level of transformation. Hence, these companies have a very great chance to succeed in the evolving market. These companies can be an example for others and can also be in the position to work with rivals.

Q3: the potential for change is high and theoretically "in rush", in terms of current level of transformation.
Q2: medium potential for change and current level of transformation is "in movement". They are, therefore, proactive companies.

Q1: low potential for change and level of transformation: therefore, they are at risk.

A great entrepreneur says: If a company does not follow the times in which it operates, it will become old and I do not want this to happen. Always change to remain competitive. Staying up to date, therefore, is very important for an engineer, as for all professionals, and in the field of Engineering, this is often called Continuing Engineering Education. The fundamental goal of Continuing Education is to keep the sum of competencies of an individual appropriate in time and always relevant to the demands of scientific-technical evolution. Two essential forms of Continuing Education are characterized by differing trends: self-teaching, which is continuous, and institution-based, which is occasional. The latter is characterized by generally shorter training schedules, which gives rise to the need for a stringent schedule of Continuing Education courses.

4.4 **Teaching**

Flexibility for a teacher, whatever the course's level, is extraordinarily important. A good teacher should constantly monitor his students: there are many signs, many language manifestations, especially non-verbal language, which can provide precious information for the teacher, who must be able to rapidly perceive them and change the teaching style, for example, by changing the speed of presentation or the tone of voice or the choice of examples. Subsequently, inviting students to give feedback can also provide important information. It is also very important for the teacher or, generally, for a speaker, based on the characteristics of the audience, whether known or estimated, to artfully and appropriately adapt the style of presentation.

It goes without saying that also, and especially, for a teacher, staying up to date and, therefore, Continuing Education is of the utmost importance.

Multiple choice questions

1) Flexibility, can be defined as the ability to perceive:
   a) changes in a situation,
   b) changes in a context,
   c) changes in objectives and in moods
   d) all
2) Flexibility is the ability to keep in step with the times for any future that holds whether it is good or bad.
   a) True b) False
3) Flexibility mean constantly changing opinion

   a) True b) False
4) Among your acquaintances there are examples of people who take a path and then, before reaching the end of it, shift to another and yet another, which one is true
   a) They are best flexible people
   b) They are people who never complete their path
   c) They are very effective people to adapt to change
   d) They are not disappointed and frustrated
   e) They are efficient and do not waste both time and money.
5) Choose the correct statement

a) Abandoning the chosen path, of course when there are no logical and rational reasons to do so, is a mistake that often carries a high price
b) There are two categories of "things", those which can be changed and those which cannot.
c) Being flexible means being able to distinguish things which can be changed and those which cannot.
d) All are correct

6) According to Eisenhower matrix, which one need the most critical decision
   a) Urgent not important
   b) Urgent and important
   c) Not urgent and not important
   d) Important not urgent
7) Which one these companies have a very great chance to succeed in the evolving market
   a) A company with medium potential for change and current level of transformation is "in movement"
   b) A company with low potential for change and level of transformation: therefore, they are at risk
   c) A company with the potential for change is high and they are "in movement" in terms of current level of transformation
   d) A company with the potential for change is high and theoretically "in rush", in terms of current level of transformation

Review questions

1) Define flexibility
2) What are the four directions that characterize a complete person need to consider while adapting to a new situation?
3) Does flexibility mean constantly changing opinion ?
4) Discuss among yourselves Eisenhowe Matrix? Have you applied it before?
5) Discuss how flexibility comes into picture in:
   a) Daily life
   b) Engineering profession
   c) Teaching Profession
5. What is the most difficult change you've encountered in your career?
6. How do you go about rearranging your schedule if something unplanned occurs?
7. Give me an example of when you've had to deal with a short notice request.
8. Do you like routine work?

Answer

1. D 2. B 3. B 4. B 5. D 6.B 7. C

Chapter Five

1. Ethics and integrity

Ability to follow a given deontology**.** Deontology is an ethical theory that says actions are good or bad according to a clear set of rules. Its name comes from the Greek word deon, meaning duty. Actions that align with these rules are ethical, while actions that do not are not.

5.1 **Some definitions**

The word "ethics" derives from the Greek "ethos", costume, attitude, and the word "morals" can be considered as the Latin translation (in Latin "mos" means costume. Ethics (or morals) is, therefore, the science of costumes, of attitudes, of the way of behaving and acting. "Morals" means the overall opinions, decisions and actions through which individuals express and recognize what is good and what is evil, whereas "ethics" ***means the critical refection on morals***. The moral vision corresponds to the distinction between what the individual considers "good" and what he considers "evil". It must be observed that even "bad" people have a moral conscience: in fact, they follow what they consider "good". Let's consider, for example, two fully opposite persons, such as Mother Theresa and Adolf Hitler. The former had a moral vision leading to the identification of 'good' with helping the poor and the distressed, and she adjusted her life accordingly. Adolf Hitler, instead, ***had a moral vision that identified 'good' with the creation of a superior race, and his life was oriented accordingly***.

The moral vision is, therefore, personal and needs an instrument of evaluation and correction: this instrument is ethics, which can be considered a rational and coherent system to determine good and evil. The terms "morals" and "ethics", often considered as equivalent and, largely, as synonyms, present this distinction: ***ethics is control and correction of morals***

The conditions required by ethics, which is by the evaluation of the actions and of the relative behavior, refer to:

a) Reason: the subject must possess the necessary rationality to evaluate good and evil, as they are the subject of ethics; he must also possess the capacity to distinguish between good and evil in relation to ethics and not to the "moral conscience"

b) Ideology, or the overall principles underlying ethics and pointing out what is good and what is evil; we are, therefore, concerned with natural ethics, Christian ethics, Marxist ethics and so on

c) Free Will: it is obvious that after evaluating good and evil by using ethics as a tool, the individual must be free from any type of compulsion to act consequently. Ethics can also be defined according to its own characteristics as:

I. Teleological: it starts from the principle that an ethical action produces good, thus prevailing on evil; according to teleological ethics, the target of the action prevails on the subject's intention and on the means to reach it; it can be concisely expressed as "the target justifies the means"
II. Deontological: when evaluating an action, the subject's intention must also be considered, since it is deemed to prevail on the target action.Concerning the subject to be studied, we can still distinguish between.
III. Theoretical ethics: it establishes the basis of the duty and deals with the laws of human actions and of conscience, considered as the ability to know the laws and to apply them to the circumstances.

IV. Practical ethics: it deals with duties and infringements. We also speak of descriptive ethics (which describes the behavior of human beings) and of prescriptive (which gives instructions about duties) and subjective ethics (which deals with the acting subject, irrespective of the actions and intentions), as well as of objective ethics (which considers the action relative to the common values and to the institutions).

The utilitarian approach to ethics must try to get the maximum advantage for the maximum number of people. It can be:

a) Based on actions: the ethics of each action is evaluated according to a "for and against" criterion, that is in relation to the action itself

b) Based on rules: the ethical rules are evaluated according to the benefits implied.
The ethical content and the consequent judgment of an action can vary according to certain circumstances. Some of them can be traced to the following:

I. Ignorance, which can be referred either to the existence of the law or to the fact that a certain action is included in a particular law; it is always linked to the lack, sometimes faulty, of essential information
II. Fear, which can affect both internal and external actions; fear can refer both to others' judgment and to the possibility of making mistakes, that is "to create a bad impression"
III. Violence, which can influence external actions
IV. Education, which can distort the concept of "good" or "evil"
V. Disease, which can press the subject to do actions of which he is not fully responsible, such as, for example, in the case of kleptomania.

Kleptomania - is a mental health disorder that involves repeatedly being unable to resist urges to steal items that you generally don't really need. Often the items stolen have little value and you could afford to buy them. Kleptomania is rare but can be a serious condition.

The ethical level of a deed can vary in relation to the circumstances in which it happens. Some general rules are pointed out here under:

a) An essentially good action can become better in terms of purpose; for instance, if someone works in the best way aiming at the community's advantage, this can be considered preferable to working in order to draw the boss's attention to himself

b) A good or neutral action becomes negative if the target is negative; for instance, it is certainly positive to apply the correct rules of "design science", but it becomes obviously negative, if it is used to produce antipersonnel mines

c) A negative action does not become good if the purpose is positive; for instance, working in a firm producing the abovementioned mines does not become a positive action if the engineer "has got a family" to support

d) A good or neutral action with good and bad effects is allowed, if the good effects overcome the bad ones; for instance, not to pass a seriously unprepared student at the state exams has negative effects on the candidate and positive ones on the community, and the advantages for the community are greater than those for the student

e) A good or bad action in terms of objective and aim can become better or worse according to the circumstances.

For instance, working at one's best is certainly positive and can be even better if the aim is to give a positive service to the community. A further example is working superficially, which is undoubtedly negative and is even worse if this way of working is done to get a colleague blamed for it. Deontology studies duties in relation to specific social situations. Deontology can also be defined as "work ethics", while "integrity" is related to the intents, with what you intend to do. If concerned with a certain profession, deontology is always considered a synonym of "professional ethics" and, therefore, it makes up the whole of the behavioral rules relative to this profession. Deontology is consequently a concept that includes both (moral) ethics and professional ethics. The last can be considered as an individual's job where he has got a good level of qualification. The profession has some intrinsic fundamental characteristics:

a) It requires a remarkable training period
b) The training has got an intrinsic remarkable intellectual component
c) Knowledge and skills are essential to give the society a valid service
d) It is characterized by a high level of decisional autonomy
e) It requires an ethical rule.

Therefore, this is the link between the profession and the ethics from which deontology comes.
In this module, the term "deontology" will, therefore, be used with this meaning; hence, as a synonym of "professional ethics". Deontology is strictly connected with the subject's responsibility. In the field of engineering as well as in others, a good test of responsibility can be the question: "Before acting in a certain situation, how should an engineer behave when there is nobody to control him?". Another criterion is to evaluate our behavior by asking ourselves if such behavior might be approved if another person were to behave in this manner towards us, following the old maxim: do not do unto others what you do not want done unto you.

5.2 **General criterion to determine a specific deontology**

A general criterion for determining a specific deontology relative to a specific profession can be the one deriving from the analysis of the "deontological space" (Fig. 5.1). It consists of three axes relative to

a) Activities deriving from an analysis of the professional profile in question; for example in the field of engineering we can refer either to the academic courses or to the type of activity carried out

b) Contexts of the activities and, in particular, persons or categories of persons the professional can come into contact with; generally speaking, they can be, besides themselves, colleagues, superiors, subordinates, customers, suppliers of products and suppliers of services

c) Ethical principles, coming from the ideology to which they refer. So, if we refer to the Christian deontology, the ethical principles will be the evangelical ones; if we refer to natural deontology, they will be the natural ones and so on. The points in space, the "coordinates" activities/contexts/principles, are the deontological problems, professional situations where it is necessary to make ethical decisions.

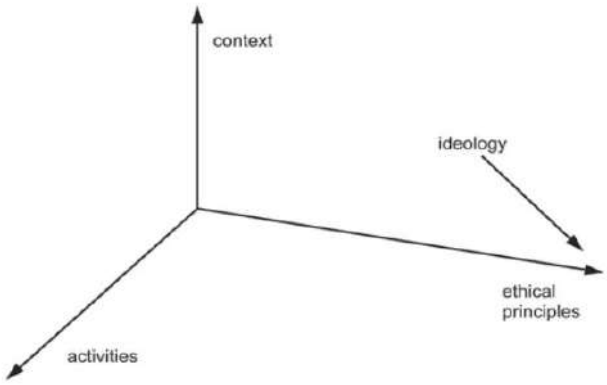

Fig. 5.1 Deontology space

Figure 5.2 represents a particular case of the application of the general case. The ethical principle "to serve the truth" can derive from the natural ideology. In the specific example, we can consider design as human activity, while the context is the overall users of the product in the course of planning. The point of "deontological space" characterized by the three above-mentioned "coordinates" corresponds to the deontological problem "to serve the truth when designing with regard to the users of the product". An analysis of this problem leads to identify the duty to write the product instructions with the utmost precision. Another example could be the one that refers to the following coordinates:

a) Ethical principle "Not to cause physical harm to the persons"
b) Activity: "design"
c) Context: "users of the product".

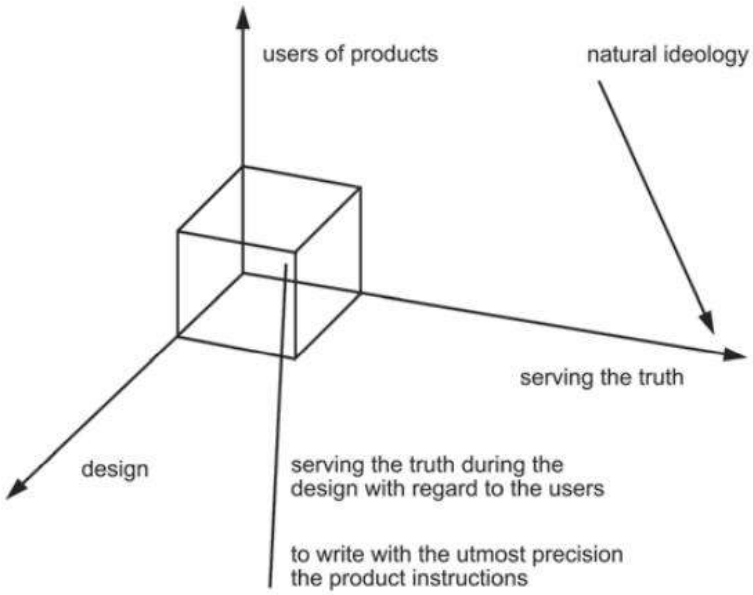

Fig. 5.2 Specific case to determine a deontology

The deontological problem might be: *to apply the criteria of correct design with the utmost care to reduce the risk to a minimum when using the product. Moreover, to inform the users with the utmost precision and completeness about the residual risk and to identify the criterions of active and passive safety.*

5.3 **Use of a determined deontology**

Once a deontology has been defined, it can be used in the light of a concept of ethical cycle (Fig. 5.3).

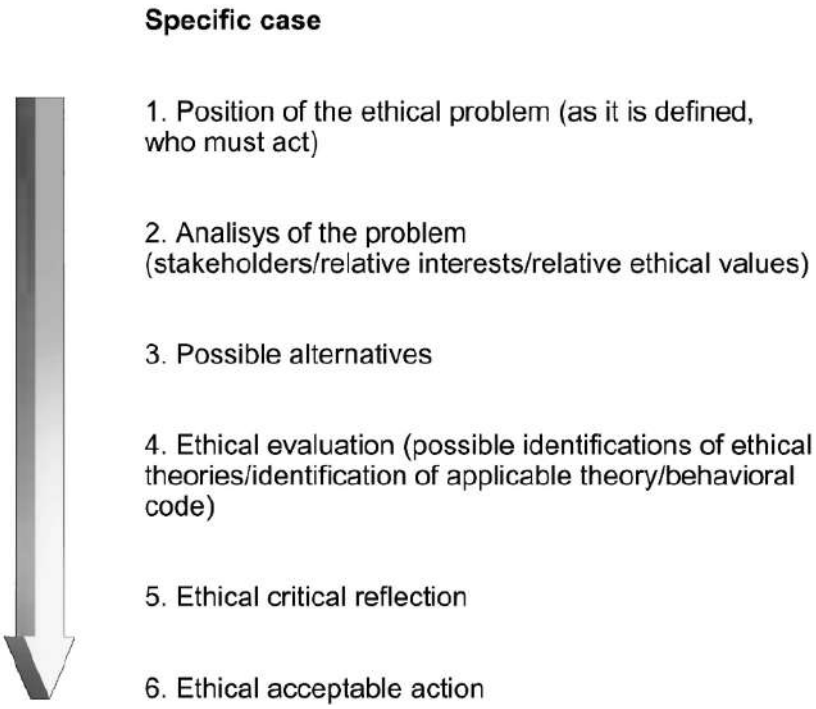

Fig. 5.3 Schema of an "ethical cycle"

Table 5.1 Example of application of an ethical cycle

Phases	Situation
1. Position of the problem	A machine at the building site overturns and crushes a worker that immediately dies. The problem is to identify how the appointed Technical Advisor must act in a court of law
2. Analysis of the problem	The causes of crushing are recognized in the following points: (a) The machine is on a ground with a considerable transverse inclination (b) The container is full of thick concrete (c) The reaction couple caused by the drum starting up, summed to the overturning couple due to the transverse inclination of the ground. Moreover, but there is no evidence in this regard, the drum "starts up" suddenly The stakeholders are brought back to:

	(a) The machine's designer (b) The machine's driver
3. Possible alternatives	They can be traced to: (a) Design mistake: must the machine be designed and built in such a way as to stand up to the circumstances listed under 2? (b) Driving error: must the driver avoid the combination of circumstances listed under 2?
4. Ethical evaluations	(a) The designer's responsibility: he must foresee possible driving errors, but is contemporaneity really an "unpredictable" combination? (b) The driver's responsibility: can it be foreseen that, during site work, the driver can predict all those combined actions?
5. Ethical reflections	It seems that there are no clear responsibilities either for the designer or for the driver
6. Ethically unacceptable action	Since, in all honesty, both designer and driver do not seem to be at fault, the incident can be considered as caused by mere fatality

5.4 **Some examples of ethics**

5.4.1 **Introduction**

This chapter presents and briefly comments some "ethics" of different origins, since they can represent a useful introduction to the core point of this module, which is the engineer's deontology**.**

5.4.2 **The base of roman ethics**

The base of Roman ethics, on which many legislations are founded even today, is expressed in the maxim of Enea Domizio Ulpiano (Tiro ca 170–Rome 228), one of the greatest Roman jurists, from whom Emperor Justinian the Great also largely drew for the Digesto. The maxim is the following:

Justice consists of the constant and perpetual will to attribute his own right to everyone. The rules of the right are: to live honestly, not to harm others, to give everyone his own. When reflecting on this maxim, which is so succinct, we cannot fail to admire the synthesis, typical of ancient Rome, and how it is the foundation of any form of justice. It is pointless saying that if everybody were to observe these rules, the world would be very different!

5.4.3 **Ethics in the engineering profession**

5.4.3.1 **General principles**

Engineering is a wide and articulated profession, with a large number of facets. A general discussion is very difficult. However, Four Questions Test can apply to each of them. The design engineer will be considered here, as an example. The professional profile of the designer can be traced to the following definition: Starting from the function and specifications assigned (if necessary, correctly formalized)

- Using methods (design methodology, ...) and means (hardware, software, materials, components, …)
- He determines all the information necessary to make an industrial product (shapes, dimensions, materials, tolerances)

- In such a way that the product has acceptable behavior in all phases of its lifecycle.

Table 5.2. The four questions test as a base for the ethical conduct of an industrial designer

Questions	Duties of the designer
1. Serve the truth	(a) Great focus on professional training (b) Great focus on updating (c) Match the challenges with your competencies in the work you take on (d) Each statement (both technical and not) must correspond to the truth
2. Serve justice	(a) Honest behavior towards all human beings (professional operators and users of technical products) (b) A particularly strict behavior when acting as a court-appointed technical advisor in a Court of law (c) A high level of labor productivity that can become an example for others
3. Improved interpersonal relationships	(a) Avoid, beyond any legal boundary, any situation where danger or inconvenience to all users of technical products can occur in any stage of the product's lifecycle: production, distribution, usage, disposal (b) Avoid designing products that encourage excessive consumerism in users (c) The financial gain must not be higher, as a goal, than the effort to improve the product, in view of enhancing relationships between people (d) Be an example of professionalism, motivation, passion
4. Advantage for every human being	(a) Carefully consider all the effects that the product being designed can have on users, in terms of health, safety, education and ethical improvement (b) The advantage for users of the product must be at least as important as the financial gain for the designer (c) Always keep in mind that the attitude of the subject always influences others, to a higher or lesser degree

Table 5.2 shows an example of how a deontology of designers can emerge from the four questions test.

5.4.3.2 An Experiment

Ethics begins to find some space, which should be increased, in educational programs. In this regard, this application of the Four Questions Test to a didactic experiment may be interesting.

5.4.7 **Ethics of the engineering teacher**

The activity of the engineering teacher, like any other teacher, is attributable to the following three areas:

a) Research, which is production of new knowledge
b) Teaching, i.e., transmission of knowledge and verification of the level reached by the learner
c) Organization, i.e., contribution to the function of structures.

5.4.7.1 **Ethics of research**

Research is the production and enlargement of knowledge. It is important to distinguish between pure and applied research. Pure research can be defined, with Galileo, as "reading in the book of Nature": such research can, therefore, be identified with recognition of an existing situation; moreover, it is not "good", and never "bad". Ethical aspects can be involved by considering the means of the research: if a research study, for instance, needed the death of human beings, it would not be ethically acceptable, also if it were connected with new knowledge. Applied research presents a different situation: such research, based on the results of pure research, upgrades human power and, therefore, can have two ethical aspects, because their applications can be either positive or negative. This character, however, particularly concerns the use, instead of the results. It is, therefore, necessary to propose ethics for users too.

5.4.7.2 **Ethics of didactics**

Didactics can be defined as the transmission of scientific-technical contents by using a system of signs: didactics is also the formalization of given contents. An example of ethics for teachers can also be derived from the Rotarian "Four Questions Test" (Table 5.4)

Table 5.4 Application of the "Four Questions Test" to the ethics of didactics

Questions	Contents	Form
True	Correctness Updating	Results optimization
Right	Congruence with requirements (of other courses and of professions)	Correct and objective evaluation of results
Amelioration of relations among human Beings	Difficulties congruent with the student's level Give an example of ethical living, not only of technique	Adequate competitiveness
Advantages for all other Persons	Objects and contents that are congruent with the requirement	Results optimization

Hence, proposing an approach to a "teacher's ethics", it is:

a) Correctness and updating of contents: such a requirement encourages the teacher to keep reliable and updated sources as reference point
b) Contents congruent with the requirements: the aims and the contents of didactics shall be congruent with the requirements of both professional and other related courses
c) Difficulties congruent with the student's level: the difficulties of didactics shall be congruent with the student's level, by taking into account the level of didactics and of what is taught
d) Example of ethical life, not only of technique: a teacher should be an example in the human and deontological field
e) Optimization of results: it is necessary to connect the objectives with the available time by using the most adequate methods and means
f) Adequate competitiveness: it is important that the students work in adequate milieu, with good integration between competition and cooperation.

Table 5.5 Application of the rotary "Four Questions Test" to the ethics of the organizational activity

Questions	Contents
True	Correspondence of every statement to the truth
Right	Willingness to contribute to the function of structures based on personal competence
Amelioration of the relations among human beings	Maintaining proper relations with colleagues one is working with, without evading a task by saying:"Somebody else will, anyhow, do it"
Advantages for all other persons	Willingness to help colleagues Avoiding non-constructive criticism expressed for the sole purpose of discrediting colleagues Making the most of time dedicated to work, avoiding pointless words

Multiple choice questions

1) Which one is not true about ethics
   a) Actions that align according to a clear set of rules are ethical, while actions that do not are not
   b) It means the critical refection on morals
   c) Ethics is an instrument of evaluation and correction for the moral vision which is personal
   d) None
2) The rules of the right are:
   a) to live honestly, b) not to harm others, c) to give everyone his own d) all e) none
3) which one of the following ethical conduct of an industrial designer is not serving the truth
   a) Great focus on professional training
   b) Great focus on updating
   c) Match the challenges with your competencies in the work you take on
   d) Honest behavior towards all human beings (professional operators and users of technical products)
4) Which one of the following ethical conduct of an industrial designer is not serving justice
   a) Honest behavior towards all human beings
   b) A particularly strict behavior when acting as a court-appointed technical advisor in a Court of law
   c) A high level of labor productivity that can become an example for others
   d) Great focus on professional training

5) Which the following activity is not attributable to the engineering teacher
   a) Research, which is production of new knowledge
   b) Teaching
   c) Organization, i.e., contribution to the function of structures
   d) all
   e) none

6) What is Deontology?

   a) it studies duties in relation to specific social situations

b) it can also be defined as work ethics
c) it makes up the whole of the behavioral rules relative to this profession
d) it is consequently a concept that includes both (moral) ethics and professional ethics
e) all

7) Which one of the following is false about pure research?
   a) can be defined, with Galileo, as “reading in the book of Nature”:
   b) such research can, therefore, be identified with recognition of an existing situation;
   c) it is not “good”, and never “bad”.
   d) Ethical aspects can be involved by considering the means of the research:
   e) none
8) Which of the following is true about applied research?
   a) applied research presents is based on the results of pure research,
   b) It upgrades human power
   c) It has two ethical aspects which because of their applications can be either positive or negative.
   d) All

Review questions

1) Define ethics
2) Discuss the moral vision considering fully opposite persons. For example Adolf Hitler and Mother Theresa
3) What instrument we need to evaluate and correct a moral vision? (a moral vision is actually personal)
4) Discuss the concept of ethical cycle and how to apply ethical cycle
5) Explain/discuss the four questions test as a base for the ethical conduct of industrial designer
6) Discuss the following
   a) Ethics of the engineering teacher
   b) Ethics of research
   c) Ethics of didactics

Answers

1. D 2. D 3. D 4. D 5. E 6. E 7.E 8. D

Chapter Six

2. Relation with others

Soft Skills related particularly to specific aspects of relation with others is examine in the following sections.

6.1 **Interpersonal relationship**

This Soft Skills can be defined as the ability to develop extraordinary relationships with others. Nobody works alone. Everyone is almost continuously in contact with a great number of people of equal, inferior or superior cultural, social or professional status. We could say this happens in all contexts, in both daily and professional life, whatever the occupation. Hence, we could say that everyone lives and operates in a group of people, be it large or small. So personal relationships play a crucial role, generally with the following objectives:

a) Achieve group results; they must be greater than the desire for personal gratification or the tendency to overcome others, which some group members might experience;
b) b) Mutual respect among the people who make up the group. This does not mean always agreeing and saying that things are going well, when they are not. When required to achieve the objective it is necessary to be firm, while still respecting the individual. We can thus create a network of relationships where positivity is conveyed, establishing a harmonious atmosphere among group members, which allows maximizing the results achieved. This would require people who make up the group to view every situation in a positive light. Unfortunately, it is more common for people to see things negatively, to see problems in every opportunity. We need a shift in perspective, in other words, a paradigm shift: we need to see an opportunity in every problem.

How often, in the daily life, do we see groups of people who cannot reach a decision because some members of the group will not renounce their point of view (which might be clearly questionable!) to avoid giving other members the satisfaction of accepting their proposal. These are some examples of how interpersonal relations are carried out badly, or better, not at all. In many cases, this can also be the reason why families break up due to senseless rivalries, or because they cannot take ownership of their own mistakes. In all of these cases, a consideration on the importance of correct interpersonal relationships can be very constructive for everyone involved, obviously, as long as there is no malice involved. If interpersonal relationships are important in daily life, they are even more so in the professional context, especially in the engineering field. It is precisely because of the sensitivity and the effort that engineering requires, on top of the fact that an engineer almost always works in a team, that perfect "teamwork" is required: harmony between the members of the group and, therefore, a great care for interpersonal relationships, are condition sine qua non (Indispensable prerequisite). And, in this case, a crucial role is played by the team leader.

Only too often we find an excessively authoritarian boss who creates an environment of fear, which is certainly not beneficial, both in terms of psychological wellbeing (and often even of physical wellness), but especially in terms of the team's results. This kind of leader (unwillingly, but often, intentionally) ignores the fact that the true job of a leader is (or should be) to identify each person's talents and the tasks that should be assigned, in order to optimize the overall group

results. In this case, and especially in this case, it is not necessary to be "Yes men" (which is actually negative and counterproductive). Always saying yes, perhaps to avoid annoyance or responsibilities, through laziness or for fear of other people's opinion, is a terrible way to relate to other people. Good interpersonal relationships are very important for teachers in any field, but especially in engineering. A teacher must be able to appropriately relate to students, for example by creating a feeling of healthy competitiveness and creating interest in the subject they teach. Instead, how many times do we see teachers who, far from stimulating students, instigate "hatred" for the subject they should be teaching students to love. It is also important for a teacher, when assessing students, to know how to "exploit" their mistakes, through constructive criticism, which is often a great tool to overcome mistakes.

6.2 **Positivity**

Positivity can be defined as the ability to be optimistic and to convey positivity and positive feelings to the people around us. We all have some experience of people who convey energy, who smile, who take things the right way. After meeting them, we feel re-energized and satisfied. A positive person sees an opportunity in every problem although, it should be noted, such people are not the kind of shallow person who thinks and says something along the lines of "no need to worry, everything will be all right". Such people consider positivity merely an alibi for neither thinking nor taking action. Optimism, positivity, are not do-goodism at all costs. Indeed, an optimist also knows when, if necessary, to be harsh and yet respectful. The main feature of an optimist is the ability to see the positive side of every situation. Positive people are generally quite proactive, in other words, in control. They can dominate their actions and, when faced with an unexpected event, they will first think and then choose the appropriate course of action.

On the other hand, there are people who are the exact opposite of this, who even at a glance can drain you of your energy. Criticizing everything and everybody, they see a problem in everything. After meeting these people, you feel tired, drained of energy and empty. Negative people are, broadly speaking, reactive. In other words, they tend to react automatically, without thinking and, therefore, they often act in an instinctive and erroneous manner. There are even some people who, during a personal encounter, pretend to be friendly and flaunt politeness, while around others they do not waste a chance to make you look bad, sarcastically and mockingly, perhaps with a hidden (or not so concealed) desire to have you react in a way that will put you in the wrong. In any work environment, a positive person simplifies issues, brings solutions closer and makes the environment better and more breathable. When faced with a technical problem, a "positive" engineer will be more inclined to see the strategies that can lead to a solution, and they will immediately think "I can do this!. The opposite happens with a negative person, who only sees the dark side of events. They multiply and exaggerate problems, and make life impossible for both colleagues and subordinates. A "negative" engineer, faced with a technical problem, will only see the difficulties and immediately think, "I'll never solve it!" How does a positive teacher act? They convey their passion for what they teach students, spreading positivity and hope, and showing students the best way to learn, to remember and to apply what they have learnt. They encourage students, they do not rebuke them for every mistake, and they recognize successes, saying, and "Ok, you have done a good job and made it so far, now you can make a little effort and take a step forward". It must be noted, however, that a positive teacher is not one who promotes everyone (with less effort on their part), telling them that everything is going well when it is not. A positive teacher knows how, when necessary, to be

strict, while always respecting the personality of students, recognizing the effort made by the student, and encouraging them to progress. A negative teacher will do the contrary. They do everything possible to make the subject distasteful, assigning heavy and non-productive tasks, leaving out the interesting and useful part of what they convey (or should be conveying...). A negative teacher is a lead cloak. They divest students of motivation. They do not encourage them ("you have understood nothing", "you need to start over again", "you'll never pass the test") but even discourage their initiative. It is quite evident that a negative teacher is destructive in any school, of any type and level.

6.3 **Professionalism**

Professionalism can be defined as follows:

a) Ability to look and behave in a way that is congruent with a specific work environment
b) Ability to update professional knowledge, in relation to the upgrading of the market's/environment's requirements. Professionalism is, therefore, characterized by two aspects: the ability to acquire the necessary skills and the ability to maintain them adequate for the needs over time, in other words, training and updating. In addition to the two above-mentioned aspects, the 10 Characteristics of Professionalism are also particularly interesting from the perspective of professionalism:
    1. Dress for success
    2. Confident not cocky
    3. Do what you say you will do
    4. Be an expert in your field
    5. Behave morally and ethically
    6. Maintain your poise
    7. Have good phone etiquette
    8. Strike the right tone
    9. Be structured and organized
    10. Own up mistakes.

Professional person worries, before taking on a task, about possessing the professionalism required. These skills are also expressed in many aspects of daily life, and here the discussion is closely connected to what was said about ethics. A professional person is also balanced (here we see the chapter "Awareness"): he is confident without being arrogant and precise without being fussy; he is punctual, without wanting to do everything with haste. A professional person is not one who never makes mistakes (the best one makes the least mistakes!), but he is one who knows **how to recognize his mistakes and, as far as possible, tries to remedy them.** The engineer's professionalism is obviously very important. In this regard, see many previous chapters. Here we mention, above all, the need to **remain updated**, which is an essential part of the engineer's professionalism. A very important component of professionalism is the ability to remain updated. A professional person knows how to promptly perceive changes in the market, in the environment and in the company, and is able to quickly adapt to them (also see the chapter "Flexibility"). Ability to update, means knowing how to quickly identify the "what", that is, the field where it is necessary to update and the "how", that is, the strategies and how to update. These can be:

a) Self-study, such as, for example, books, magazines, conferences, software
b) Institutionalized, such as, for example, courses, seminars and workshops organized by universities, academies, cultural and scientific institutions.

6.4 **Responsibility**

Responsibility can be defined as the awareness of personal tasks and duties, and the commitment to complete them satisfactorily. Responsibility is, therefore, strongly connected to ethics. An analysis process leads to the highlight of the two constituent concepts: awareness and commitment. Awareness means knowing one's own abilities and one's limits and knowing that our actions, our words, and our omissions have on the people around us. Commitment means the ability to recognize one's mistakes and to bear the consequences. Each of us makes mistakes: the best and the one who makes the least mistakes! The difference between the responsible and the not responsible person is that the first recognizes their mistakes and tries to remedy them. The person responsible, then, whatever his field of activity, must give a positive example to those entire close to him. It is also closely related to the ability to foresee consequences of one's behavior and to act accordingly. Responsibility, then, presupposes the freedom to decide about one's actions and, consequently, to be aware of one's behavior. It is clear that no responsibility can be attributed to a subject who is forced to adopt a certain behavior. A subject must, therefore, be considered responsible for a certain situation when the following circumstances occur at the same time:

a) The situation derives directly from the subject's behavior;
b) The subject could have foreseen, either with certainty or probability, the situation that occurred following their behavior;
c) The subject could have had the practical opportunity to act differently, thus preventing the situation from occurring.

Uncountable daily commitments enhance a person's sense of responsibility to various degrees. How many times do we witness, even in small things, someone who says, "I'll take care of it!" and then does nothing, either due to superficiality or because of other, more pressing commitments. Often the consequences of this attitude are very small, but this does not mean that, as a rule of thumb, this behavior should be loathed. If for no other reason than that people who do not accept responsibility for small things will probably do the same for important matters too.
Every engineer, when carrying out their job, has many responsibilities, which can be considerable. Responsibility in the field of engineering is strictly linked to professionalism and ethics. Too often, in the professional field, in engineering, but not only, there are professionals who try not to take responsibility, but who try to blame colleagues for their mistakes.
Responsibility, in this sense, has various levels:

a) Simply moral, when it exclusively violates moral duty and, therefore, the only penalty lies within the subject's conscience;
b) Legal, when it violates a legal obligation. In this case it can be: (b.1)civil, when the violation does not concern the penal code; for example, it can relate to a malfunctioning technical product that, due to an error in design, production, maintenance or use, can cause only a financial loss; (b.2) penal, when the violation concerns the penal code; for example, it might concern a malfunctioning technical product that causes physical harm to one or more people.

It is clear that we are faced with a combination of responsibility and deontology, and it is evident that an engineer must be well aware and sensitive to their responsibilities, not only legal, but also moral. A teacher, in any context and at any level, has a great moral responsibility towards students. Suffice to think how they place their fundamental and unique resource, their time, in the hands of their teacher, who must endeavor to make the most of it. A responsible teacher, not

only in engineering, but in every discipline, must always bear in mind that his task is not only to train professionals, but also to train people. Training good professionals is, especially, the transmission of Hard Skills, while training complete people requires a close and continuous integration between Hard Skills and Soft Skills. In the field of engineering, but this also applies to other fields, the teacher has the institutional task of training engineers, but before engineers, they must train people. Hence, the teacher must put himself forward as a figure of reference, an example to students.

The fundamental task of an engineering teacher, but once again the topic can easily be generalized, is, as mentioned in other chapters, to generate passion for what they are conveying. It is crucial because passion, once triggered, can help to overcome any obstacle. Indispensable condition to awaken passion in students is for the teacher himself to be passionate about what he is teaching, only thus is passion transmitted. Beyond generating passion, the teacher must also provide (or make an effort to provide) students with a method to face problems. Passion and method are two fundamental cornerstones of teaching and the basis of the "what" to teach, therefore the content of teaching itself. The "how" of teaching is also very important; in other words, the method used by the teacher to convey the "what". Communication, expressive skills and knowledge of didactic methodologies are crucial to the teacher. All the above fall under the tasks of a responsible teacher.

6.5 **Team work**

A team (or a work team) is a group of people with complementary skills who work together to achieve a specific goal. A team is clearly something more than a mere group of individuals. In particular, members of a group or, more accurately, a working group go about their jobs independently and meet primarily to share information. A group of department-store managers, for example, might meet monthly to discuss their progress in cutting plant costs, but each manager is focused on the goals of his or her department because each is held accountable for meeting only those goals. Teams, by contrast, are responsible for achieving specific common goals, and they are generally empowered to make the decisions needed to complete their authorized tasks.

6.6 **Some key characteristics of teams**

To keep matters in perspective, let's identify five key characteristics of work teams

1. Teams are accountable for achieving specific common goals. Members are collectively responsible for achieving team goals, and if they succeed, they're rewarded collectively.
2. Teams function interdependently. Members cannot achieve goals independently and must rely on each other for information, input, and expertise.
3. Teams are stable. Teams remain intact long enough to finish their assigned tasks, and each member remains on board long enough to get to know every other member.
4. Teams have authority. Teams possess the decision-making power to pursue their goals and to manage the activities through which they complete their assignments.
5. Teams operate in a social context. Teams are assembled to do specific work for larger organizations and have the advantage of access to resources available from other areas of their organizations.

6.7 **Why organizations build teams**

Why do major organizations now rely more and more on teams to improve operations? Executives at Xerox have reported that team-based operations are 30 percent more productive than conventional operations. General Mills says that factories organized around team activities are 40 percent more productive than traditionally organized factories. According to in-house studies at Shenandoah Life Insurance, teams have cut case-handling time from twenty-seven to two days and virtually eliminated service complaints. FedEx says that teams reduced service errors by 13 percent in the first year.

6.8 **Factors in effective teamwork**

First, let's begin by identifying several factors that, in practice, tend to contribute to effective teamwork. Generally speaking, teams are effective when the following factors are met:

- Members depend on each other. When team members rely on each other to get the job done, team productivity and efficiency are high.
- Members trust one another. Teamwork is more effective when members trust each other.
- Members work better together than individually. When team members perform better as a group than alone, collective performance exceeds individual performance.
- Members become boosters. When each member is encouraged by other team members to do his or her best, collective results improve.
- Team members enjoy being on the team. The more that team members derive satisfaction from being on the team, the more committed they become.
- Leadership rotates. Teams function effectively when leadership responsibility is shared over time.

Most of these explanations probably make pretty clear intuitive sense. Unfortunately, because such issues are rarely as clear-cut as they may seem at first glance, we need to examine the issue of group effectiveness from another perspective—one that considers the effects of factors that aren't quite so straightforward.

6.9 **Group cohesiveness**

The idea of group cohesiveness refers to the attractiveness of a team to its members. If a group is high in cohesiveness, membership is quite satisfying to its members; if it's low in cohesiveness, members are unhappy with it and may even try to leave it. The principle of group cohesiveness, in other words, is based on the simple idea that groups are most effective when their members like being members of the group.

Numerous factors may contribute to team cohesiveness, but in this section, we'll focus on five of the most important:

1. Size. The bigger the team, the less satisfied members tend to be. When teams get too large, members find it harder to interact closely with other members; a few members tend to dominate team activities, and conflict becomes more likely.
2. Similarity. People usually get along better with people like themselves, and teams are generally more cohesive when members perceive fellow members as people who share their own attitudes and experience.
3. Success. When teams are successful, members are satisfied, and other people are more likely to be attracted to their teams.

4. Exclusiveness. The harder it is to get into a group, the happier the people who are already in it. Status (the extent to which outsiders look up to a team, as well as the perks that come with membership) also increases members' satisfaction.
5. Competition. Members value membership more highly when they're motivated to achieve common goals especially when those goals mean outperforming other teams.

A cohesive team with goals that are aligned with the goals of the organization is most likely to succeed. There's such a thing as too much cohesiveness. When, for instance, members are highly motivated to collaborate in performing the team's activities, the team is more likely to be effective in achieving its goals. Clearly, when those goals are aligned with the goals of the larger organization, the organization, too, will be happy. If, however, its members get too wrapped up in more immediate team goals, the whole team may lose sight of the larger organizational goals toward which it's supposed to be working.

6.10 **Group think**

Likewise, it's easier for leaders to direct members toward team goals when members are all on the same page when there's a basic willingness to conform to the team's rules and guidelines. When there's too much conformity, however, the group can become ineffective: It may resist change and fresh ideas and, what's worse, may end up adopting its own dysfunctional tendencies as its way of doing things. Such tendencies may also encourage a phenomenon known as groupthink the tendency to conform to group pressure in making decisions, while failing to think critically or to consider outside influences.

6.11 **Why teams fail**

Teams don't always work. To learn why, let's take a quick look at four common obstacles to success in introducing teams into an organization (Greenberg & Baron [10]):

- Unwillingness to cooperate. Failure to cooperate can occur when members don't or won't commit to a common goal or set of activities. What if, for example, half the members of a product-development team want to create a brand-new product and half want to improve an existing product? The entire team may get stuck on this point of contention for weeks or even months.
- Lack of managerial support. Every team requires organizational resources to achieve its goals, and if management isn't willing to commit the needed resources—say, funding or key personnel a team will probably fall short of those goals.
- Failure of managers to delegate authority. Team leaders are often chosen from the ranks of successful supervisors first-line managers who, give instructions on a day-to-day basis and expect to have them carried out. This approach to workplace activities may not work very well in leading a team a position in which success depends on building a consensus and letting people make their own decisions.
- Failure of teams to cooperate. If you're on a workplace team, your employer probably depends on teams to perform much of the organization's work and meet many of its goals. In other words, it is, to some extent, a team-based organization, and as such, reaching its overall goals requires a high level of cooperation among teams. When teams can't agree on mutual goals (or when they duplicate efforts), neither the teams nor the organization is likely to meet with much success.

6.12 **The team and its members**

Like it or not, you'll probably be given some teamwork assignments while you're in college. More than two-thirds of all students report having participated in the work of an organized team. Why do we put so much emphasis on something that, reportedly, makes many students feel anxious and academically drained? "In the real world, you have to work with people. You don't always know the people you work with, and you don't always get along with them. Your boss won't particularly care, and if you can't get the job done, your job may end up on the line. Life is all about group work, whether we like it or not. And school, in many ways, prepares us for life, including working with others".

In placing so much emphasis on teamwork skills and experience, colleges are doing the responsible thing preparing students for the world that awaits them. Survey found that the skill that most employers value in new employees is the ability to work in teams. If you're already trying to work your way up an organizational ladder, consider the advice that "A major reason that capable people fail to advance is that they don't work well with their colleagues." The importance of the ability to work in teams was confirmed in a survey of leadership practices of more than sixty of the world's top organizations (Fortune Magazine [15]). When top executives in these organizations were asked, "What causes high-potential leadership candidates to derail? (stop moving up in the organization)," 60 percent of the organizations cited "inability to work in teams." Interestingly, only 9 percent attributed the failure of these executives to advance to "lack of technical ability." While technical skills will be essential in your getting hired into an organization, your team skills will play a significant role in your ability to advance. To be team-ready or not to be team-ready that is the question. Or, to put it in plainer terms, the question is not whether you'll find yourself working as part of a team. You will. The question is whether you'll know how to participate successfully in team-based activities.

6.13 **What skills does the team need?**

Sometimes we hear about a sports team made up of mostly average players who win a championship because of coaching genius, flawless teamwork, and superhuman determination. But not terribly often. In fact, we usually hear about such teams simply because they're newsworthy exceptions to the rule. Typically a team performs well because its members possess some level of talent. This doesn't mean, however, that we should reduce team performance to the mere sum of its individual contributions: Members' talents aren't very useful if they're not managed in a collective effort to achieve a common goal. In the final analysis, of course, a team can succeed only if its members provide the skills that need managing. In particular, every team requires some mixture of three sets of skills:

- Technical skills. Because teams must perform certain tasks, they need people with the skills to perform them. For example, if your project calls for a lot of math work, it's good to have someone with the necessary quantitative skills.
- Decision-making and problem-solving skills. Because every task is subject to problems, and because handling every problem means deciding on the best solution, it's good to have members who are skilled in identifying problems, evaluating alternative solutions, and deciding on the best options.
- Interpersonal skills. Because teams are composed of people, and because people need direction and motivation and depend on communication, every group benefits from

members who know how to listen, provide feedback, and smooth ruffled feathers. The same people are usually good at communicating the team's goals and needs to outsiders.

The key to success is ultimately the right mix of these skills. Remember, too, that no team needs to possess all these skills never mind the right balance of them—from day one. In many cases, a team gains certain skills only when members volunteer for certain tasks and perfect their skills in the process of performing them. For the same reason, effective teamwork develops over time as team members learn how to handle various team-based tasks. In a sense, teamwork is always work in progress.

6.14 **What roles do team members play?**

Like your teamwork skills, expect your role on a team to develop over time. Also remember that, both as a student and as a member of the workforce, you'll be a member of a team more often than a leader. Team members, however, can have as much impact on a team's success as its leaders.

The key is the quality of the contributions they make in performing non-leadership roles.

What, exactly, are those roles? At this point, you have probably concluded that every team faces two basic challenges:

1. Accomplishing its assigned task
2. Maintaining or improving group cohesiveness

Whether you affect the team's work positively or negatively depend on the extent to which you help it or hinder it in meeting these two challenges. We can thus divide teamwork roles into two categories, depending on which of these two challenges each role addresses. These *two categories are task facilitating roles and relationship-building roles.*

6.15 **Class team projects**

As we highlighted earlier, throughout your academic career you'll likely participate in a number of team projects. Not only will you make lasting friends by being a member of a team, but in addition you'll produce a better product. To get insider advice on how to survive team projects in college (and perhaps really enjoy yourself in the process), let's look at some suggestions offered by two students who have gone through this experience

- Draw up a team charter. At the beginning of the project, draw up a team charter (or contract) that includes the goals of the group; ways to ensure that each team member's ideas are considered and respected; when and where your group will meet; what happens if a team member skips meetings or doesn't do his or her share of the work; how conflicts will be resolved.
- Contribute your ideas. Share your ideas with your group; they might be valuable to the group. The worst that could happen is that they won't be used (which is what would happen if you kept quiet).
- Never miss a meeting. Pick a weekly meeting time and write it into your schedule as if it were a class. Never skip it. And make your meetings productive.
- Be considerate of each other. Be patient, listen to everyone, communicate frequently, involve everyone in decision making, don't think you're always right, be positive, avoid infighting, build trust.

- Create a process for resolving conflict. Do this before conflict arises. Set up rules to help the group decide whether the conflict is constructive, whether it's personal, or whether it arises because someone won't pull his or her weight. Decide, as a group, how conflict will be handled.
- Use the strengths of each team member. Some students are good researchers, others are good writers, and others have strong problem-solving or computer skills, while others are good at generating ideas. Don't have your writer do the research and your researcher does the writing. Not only would the team not be using its resources wisely, but two team members will be frustrated because they're not using their strengths.
- Don't do all the work yourself. Work with your team to get the work done. The project output is not as important as the experience of working in a team.
- Set deadlines. Don't leave everything to the end; divide up tasks, hold team members accountable, and set intermediary deadlines for each team member to get his or her work done. Work together to be sure the project is in on time and in good shape.

6.16 **Empathy**

What Is Empathy? Empathy is the ability to emotionally understand what other people feel, see things from their point of view, and imagine yourself in their place. Essentially, it is putting yourself in someone else's position and feeling what they are feeling. Empathy means that when you see another person suffering, such as after they've lost a loved one, you are able to instantly envision yourself going through that same experience and feel what they are going through. While people can be well-attuned to their own feelings and emotions, getting into someone else's head can be a bit more difficult. The ability to feel empathy allows people to "walk a mile in another's shoes," so to speak. It permits people to understand the emotions that others are feeling.

6.16.1 **Signs of empathy**

For many, seeing another person in pain and responding with indifference or even outright hostility seems utterly incomprehensible. But the fact that some people do respond in such a way clearly demonstrates that empathy is not necessarily a universal response to the suffering of others. If you are wondering whether you are an empathetic person, here are some signs that show that you have this tendency:

- You are good at really listening to what others have to say.
- People often tell you about their problems.
- You are good at picking up on how other people are feeling.
- You often think about how other people feel.
- Other people come to you for advice.
- You often feel overwhelmed by tragic events.
- You try to help others who are suffering.
- You are good at telling when people aren't being honest.
- You sometimes feel drained or overwhelmed in social situations.
- You care deeply about other people.
- You find it difficult to set boundaries in your relationships.

6.16.2 **Types of empathy**

There are several types of empathy that a person may experience. The three types of empathy are:

- Affective empathy involves the ability to understand another person's emotions and respond appropriately. Such emotional understanding may lead to someone feeling concerned for another person's well-being, or it may lead to feelings of personal distress.
- Somatic empathy involves having a physical reaction in response to what someone else is experiencing. People sometimes physically experience what another person is feeling. When you see someone else feeling embarrassed, for example, you might start to blush or have an upset stomach.
- Cognitive empathy involves being able to understand another person's mental state and what they might be thinking in response to the situation. This is related to what psychologists refer to as the theory of mind or thinking about what other people are thinking.

6.16.3 **Empathy vs. sympathy vs. compassion**

While sympathy and compassion are related to empathy, there are important differences. Compassion and sympathy are often thought to be more of a passive connection, while empathy generally involves a much more active attempt to understand another person.

6.16.4 **Uses for empathy**

Being able to experience empathy has many beneficial uses.

- Empathy allows you to build social connections with others. By understanding what people are thinking and feeling, you are able to respond appropriately in social situations. Research has shown that having social connections is important for both physical and psychological well-being.
- Empathizing with others helps you learn to regulate your own emotions. Emotional regulation is important in that it allows you to manage what you are feeling, even in times of great stress, without becoming overwhelmed.
- Empathy promotes helping behaviors. Not only are you more likely to engage in helpful behaviors when you feel empathy for other people, but other people are also more likely to help you when they experience empathy.

6.16.5 **Potential pitfalls of empathy**

Having a great deal of empathy makes you concerned for the well-being and happiness of others. It also means, however, that you can sometimes get overwhelmed, burned out, or even over stimulated from always thinking about other people's emotions. This can lead to empathy fatigue. Empathy fatigue refers to the exhaustion you might feel both emotionally and physically after repeatedly being exposed to stressful or traumatic events. You might also feel numb or powerless, isolate yourself, and have a lack of energy. Empathy fatigue is a concern in certain situations, such as when acting as a caregiver. Studies also show that if healthcare workers can't balance their feelings of empathy (affective empathy, in particular), it can result in compassion fatigue as well. Other research has linked higher levels of empathy with a tendency toward emotional negativity, potentially increasing your risk of empathic distress. It can even affect your judgment, causing you to go against your morals based on the empathy you feel for someone else.

6.16.6 **Impact of empathy**

Your ability to experience empathy can impact your relationships. Studies involving siblings have found that when empathy is high, siblings have less conflict and more warmth toward each

other. In romantic relationships, having empathy increases your ability to extend forgiveness. Not everyone experiences empathy in every situation. Some people may be more naturally empathetic in general, but people also tend to feel more empathetic toward some people and less so toward others. Some of the factors that play a role in this tendency include:

- How you perceive the other person
- How you attribute the other individual's behaviors
- What you blame for the other person's predicament
- Your past experiences and expectations

Research has found that there are gender differences in the experience and expression of empathy, although these findings are somewhat mixed. Women score higher on empathy tests, and studies suggest that women tend to feel more cognitive empathy than men. At the most basic level, there appear to be two main factors that contribute to the ability to experience empathy: genetics and socialization. Essentially, it boils down to the age-old relative contributions of nature and nurture. Parents pass down genes that contribute to overall personality, including the propensity toward sympathy, empathy, and compassion. On the other hand, people are also socialized by their parents, peers, communities, and society. How people treat others, as well as how they feel about others, is often a reflection of the beliefs and values that were instilled at a very young age.

6.16.7 **Barriers to empathy**

Some people lack empathy and, therefore, aren't able to understand what another person may be experiencing or feeling. This can result in behaviors that seem uncaring or sometimes even hurtful. For instance, people with low affective empathy have higher rates of cyber bullying. A lack of empathy is also one of the defining characteristics of narcissistic personality disorder. Though, it is unclear whether this is due to a person with this disorder having no empathy at all or having more of a dysfunctional response to others. A few reasons why people sometimes lack empathy include cognitive biases, dehumanization, and victim-blaming.

6.16.8 **Cognitive biases**

Sometimes the way people perceive the world around them is influenced by cognitive biases. For example, people often attribute other people's failures to internal characteristics, while blaming their own shortcomings on external factors. These biases can make it difficult to see all the factors that contribute to a situation. They also make it less likely that people will be able to see a situation from the perspective of another.

6.16.9 **Dehumanization**

Many also fall victim to the trap of thinking that people who are different from them don't feel and behave the same as they do. This is particularly common in cases when other people are physically distant. For example, when they watch reports of a disaster or conflict in a foreign land, people might be less likely to feel empathy if they think that those who are suffering are fundamentally different from themselves.

6.16.10 **Victim blaming**

Sometimes, when another person has suffered a terrible experience, people make the mistake of blaming the victim for their circumstances. This is the reason that victims of crimes are often

asked what they might have done differently to prevent the crime. This tendency stems from the need to believe that the world is a fair and just place. It is the desire to believe that people get what they deserve and deserve what they get and it can fool you into thinking that such terrible things could never happen to you.

6.16.11 **Causes of empathy**

Human beings are certainly capable of selfish, even cruel, behavior. A quick scan of the news quickly reveals numerous unkind, selfish, and heinous actions. The question, then, is why don't we all engage in such self-serving behavior all the time? What is it that causes us to feel another's pain and respond with kindness? The term empathy was first introduced in 1909 by psychologist Edward B. Titchener as a translation of the German term einfühlung (meaning "feeling into"). Several different theories have been proposed to explain empathy.

6.16.12 **Neuro scientific explanations**

Studies have shown that specific areas of the brain play a role in how empathy is experienced. More approaches that are recent focus on the cognitive and neurological processes that lie behind empathy. Researchers have found that different regions of the brain play an important role in empathy, including the anterior cingulate cortex and the anterior insula. Functional MRI research also indicates that an area of the brain known as the inferior frontal gyrus (IFG) plays a critical role in the experience of empathy. Studies have found that people who have damage to this area of the brain often have difficulty recognizing emotions conveyed through facial expressions.

6.16.13 Emotional Explanations

Some of the earliest explorations into the topic of empathy centered on how feeling what others feel allows people to have a variety of emotional experiences. The philosopher Adam Smith suggested that it allows us to experience things that we might never otherwise be able to fully feel. This can involve feeling empathy for both real people and imaginary characters. Experiencing empathy for fictional characters, for example, allows people to have a range of emotional experiences that might otherwise be impossible.

6.16.14 **Prosocial explanations**

Sociologist Herbert Spencer proposed that empathy served an adaptive function and aided in the survival of the species. Empathy leads to helping behavior, which benefits social relationships. Humans are naturally social creatures. Things that aid in our relationships with other people benefit us as well. When people experience empathy, they are more likely to engage in prosocial behaviors that benefit other people. Things such as altruism and heroism are also connected to feeling empathy for others.

6.16.15 **Tips for practicing empathy**

Fortunately, empathy is a skill that you can learn and strengthen. If you would like to build your empathy skills, there are a few things that you can do:

- Work on listening to people without interrupting
- Pay attention to body language and other types of nonverbal communication
- Try to understand people, even when you don't agree with them
- Ask people questions to learn more about them and their lives
- Imagine yourself in another person's shoes
- Strengthen your connection with others to learn more about how they feel

- Seek to identify biases you may have and how they affect your empathy for others
- Look for ways in which you are similar to others versus focusing on differences
- Be willing to be vulnerable, opening up about how you feel
- Engage in new experiences, giving you better insight into how others in that situation may feel
- Get involved in organizations that push for social change

6.16.16 **A word from very well**

While empathy might be lacking in some, most people are able to empathize with others in a variety of situations. This ability to see things from another person's perspective and empathize with another's emotions plays an important role in our social lives. Empathy allows us to understand others and, quite often, compels us to take action to relieve another person's suffering.

6.17 **Engagement**

Engagement is crucial for all activities and at all times. It presents two essential aspects. It can be active, when the subject involves other people by focusing on their talents (the brain's emotional hemisphere is very important in this case), on their passions and on their paradigms (and empathy is a valuable ally here). It must be said that engaging another person does not mean imposing decisions on others, at all costs. Engagement must always be based on respect for the person and his characterizing talents.

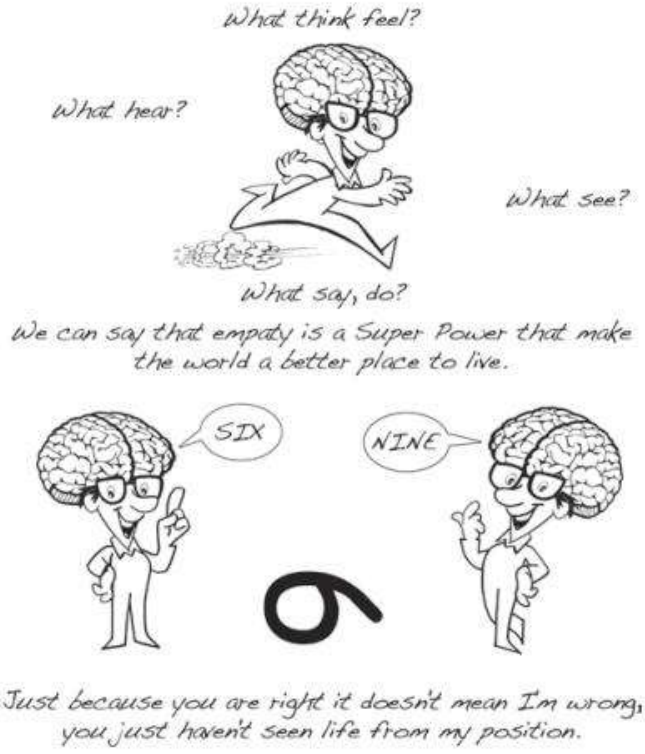

Fig. 6.3 The empathy map

Then we find passive engagement, which is not less important. In this case, the subject allows himself to be involved in new initiatives, in paradigms as yet unexplored, in new ideas. Once

again, we must underscore the fact that getting involved does not mean non-critical acceptance of the ideas of the "first passer-by" but, rather, processing every proposal both critically and ethically. Engagement requires awareness of codes of conduct and of behavior that are generally accepted in the various contexts and frameworks. Moreover, it requires understanding the cultural, social and economic dimensions of specific contexts, awareness of the subject's value and of his potential contribution in a given context. Engaging also means expressing and comparing identity, points of view, needs and personal and context-related desires. Actions and activities performed with a proper degree of engagement can actually "leave a lasting impression" on people. Engagement can be either positive or negative. The former encourages virtuous behavior, while the latter induces wrong behaviors. Hence, engagement must always be screened by ethical principles that, as a rule of thumb, lead to the exclusion of negative engagement. It is also true that engagement, as mentioned, must leave an "impression", obviously a positive one, in the people involved.

They must, anyhow, learn a lesson from engagement. Indeed, the etymology (from the Latin form) of the word "teach" means "impress" "in", that is convey something that transforms and leaves a deep inner impression. Engagement is of the utmost importance for teamwork, whether it concerns a team, an office, a company or an association. It encourages people to share the principles, the objectives and the mission of the team they belong to. Healthy engagement strengthens the team, facilitating the achievement of objectives, without emphasizing the effort required to achieve them. Indeed, suffice to think that a team's fate always moves through the people who form it. They are the most important component of every initiative; they are far more important than any raw material and any software! Engagement is crucial in all moments of daily life. Knowing how to engage others and to be engaged even in small things makes all decisions easier and more productive. It is very easy to have experience of people that, even only in small things, are always of the opposite opinion, even if it is clearly wrong. Such people are resistant to be engaged, even in positive attitude. On the contrary, there are people that go to great lengths to engage others in negative behavior.

As mentioned, engagement (both active and passive) is particularly significant for teamwork. This leads to the essential role of engagement in the field of engineering that, as a rule of thumb, entails teamwork. An engineer must be able to engage his collaborators, transmitting enthusiasm to make the work on positive projects. Only in this way, he will be able to transmit passion to the students. And with passion, every obstacle is overcome. A teacher who does not involve students, generating passion for the subject taught, is certainly not a good teacher. A teacher must also be capable of engaging with students, at least up to a certain point and with those who respond well to the teaching provided. To this aim, it is essential that a teacher has a passion for what he teaches himself.

6.18 **Leadership**

The Leader must be able to guide a group of people, motivating them to achieve common objectives. A leader must also be capable of delegating.
Becoming excellent leaders involves developing four key points:

1. Inspire trust
2. Clarify the objectives
3. Align systems
4. Release talent.

Trust has a positive effect on whatever the leader says. Low levels of trust have a high cost for the organization, with the effect of a tax on relationships and a landmine for productivity and creativity, making it impossible, in practice, to achieve great results. A high standard of trust strengthens communication, facilitates teamwork and attracts followers. Clearly define the goals, as they are the essential reasons for an organization to have a vision, a mission, a set of values and strategies that should also be related to each corporate team's objectives (strategic connection). Aligning systems means carrying out a process, a method and a set of procedures targeted at implementing priorities, allowing people to do their utmost, to be capable of working regardless of the leader's physical presence, and to look beyond the leader's presence in the organization. Releasing talent is one of the main duties of a leader who, besides being capable of providing support to achieve the objectives of individuals, thus enhancing their motivation, is capable of lighting the fame required to develop the talent that underpins a vocational calling.
A new era has to achieve great objectives by making the most of the highest levels of human genius and of motivation. Hence the need for leaders who follow new paradigms and possess innovative skills and tools. What do excellent leaders do first? They see people as a single unit made up of body, mind and spirit, rather than consider them only as fixed costs. They must also be skilled in developing a successor, teaching him the "secrets of the job", and providing him their best guidance without fearing his success. The leadership in the era of V.U.C.A. (e.g. Volatility, Uncertainty, Complexity, and Ambiguity) world can be developed as follows. Form the point of view of volatility:

- Drivers: Change Nature; Change Dynamics; Change Rate and Speed Effects: Risks; Instability; Flux
- Demands: Vision: Take Actions; Probe Changes

Form the point of view of uncertainty:

- Drivers: Unpredictability; Potential Surprises; Unknown Outcomes
- Effects: Direction Paralysis Due to Data Overload
- Demands: Understanding: Wider Understanding and Different Perspectives.

Form the point of view of complexity:

- Drivers: Tasks Correlation; Multifaceted Effects; Influencers
- Effects: Unproductive; Dualities
- Demands: Clarity: Key Focus; Flexible; Creative.

Form the point of view of ambiguity:

- Drivers: Ideal versus Actual, Misinterpretation
- Effects: Induce Doubt and Dist Trust Lapses in Decision
- Making; Hurt Innovation
- Demands: Agility: Decision Making; Innovation.

New rules needed for getting the right things done in difficult times. As a Team leader today you face an unprecedented challenge. This is not the time to reflect but to act, decide and energize the people around you with extreme urgency. The hard true is that we have managed successfully during the prolonged period of good times may not be up to the challenges confronting them today. The Leader has to provide reassurance as well guidance to everyone through some aspects:

- Recognizing reality: there is simply no question that everything will be different two / three years from now.
- Reallocating the true: there is the need to interact with other more frequently and therefore the increased intensity requires a different time model matrix.
- Protecting the Core: it is necessary to identify the constituents and things that are the core of your activity and protect them from loss or damage during the crisis.
- Being transparent: the two major responsibilities, that must to be met, are the information flow and motivation. You must be prepared to listen to everyone, at any level. in order to discover what is in their minds, what they are worried about and what new ideas they have for doing something improved.

The most powerful of all competences for Leaders is the "inspiration". It is the quality most valued and is the factor most correlated with commitment of people and satisfaction. In addition, it will be important, that Leader action have to be bold or showing an ability to take risks confident and courage will also be necessary to explain how you reached your decision and why it could be the best decision to remain committed to a plan already in place. The Paradigm of the Global Person, very important for a leader can be expressed as follows:

"SPIRIT - HEART - MIND - BODY" Very important, also is the impact of inspiration: while inspiring others is a very critical competence. The important characteristics are communication skills and tenacity. Figure 6.4represents how such characteristics can allow a possibility of positioning of the leader. One important dimension of becoming a better leader is to clear about the outcome that have been shown to truly make a significant difference:

- Productivity
- Confidence
- Optimism and Hope
- Initiative
- Responsible behavior
- Enthusiasm
- Resiliency.

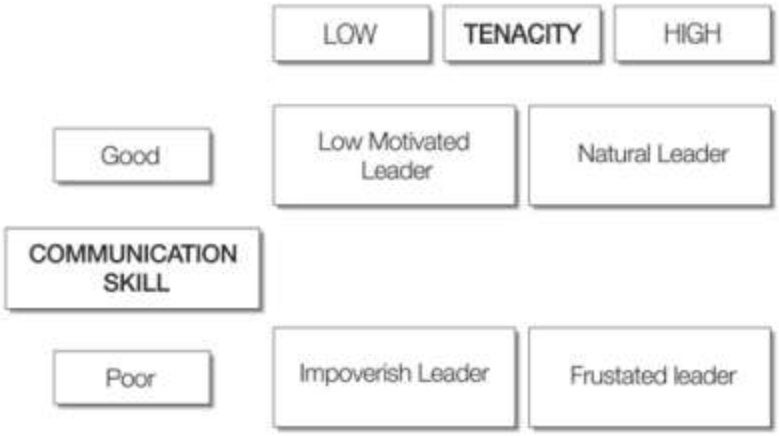

Fig. 6.4 Positioning of the leader in relation to communication skills and tenacity

Leaders inspire and motivate those around them determining a strong Contagious Emotions which fall roughly into two categories as follows:

1. New behaviors and outcomes
2. New attitudes and emotions.

The Leader is able to build this because all emotions are highly contagious from one individual to the next. The stronger the emotions that are expressed by the leader and the more willing and able the leader is to convey these emotions. The more change occurs within those being led. We can easily say that emotions are the DNA leader inspiration. It becomes essential therefore that inspirational leaders must be also excellent communicators and the most important key inspiring communication is that leaders are able to step into the listener shoes. The final important step is the ability to develop people and fostering motivation.

Review questions

1) Discuss the crucial role played by personal relationship with their objectives
2) Discuss why personal relationship is so important for engineering profession
3) Discuss the difference between positive and negative person. Take examples may be in your work place
4) How do you define professionalism?
5) Discuss the 10 characteristics of professionalism
6) Define responsibility
7) What is the difference between team and group?
8) Discuss some key characteristics of teams
9) Discuss why we need to build teams and how we nake team effective
10) Discuss why teams fail?
11) Discuss the necessary skills that the team need to have
12) What is leadership? Discus the transformational leadership and its characteristics

Multiple choice questions

1. What is a key step in Teamwork?

a) Leadership b) organization c) responsibility d) all

2. What does Teamwork mean?
   a) To work well with others
   b) To communicate well
   c) To work hard
   d) To work using soft skills
3. How do you use teamwork in your everyday life?
   a) Help old lady across the street
   b) Work with students to get an assignment done
   c) Walk someone to class
   d) A and b
4. Teamwork is a useful leadership skill.
   a) True b) false
5. Team work is used in every job
   a) True b) false
6. What is not an important factor in teamwork?

a) The team must receive external support and encouragement
b) The team must not help their team member
c) The team must have results driven structure

7. You do not use teamwork in school
   a) True b) False
8. What are the correct 8 steps of teamwork? (in order)
   a) Clear goal, result driven structure, unified commitment, collaborative climate, external support, competent team members, principle leadership, understood by all
   b) Clear goal, results-driven structure, competent team members, unified commitment, collaborative climate, understood by all, external support, principled leadership
   c) Result driven structure, unified commitment, collaborative climate, principle leadership, external support, competent team members, understood by all, clear goal.
9. The team must have a principle leadership
   a) True b) False

10.What do you mean by teamwork?

a) Setting out alone b) Working with the team to get what everyone wants c) Taking control of the team to do your work d) Creating problems for everyone

Answers

1. D 2. A 3. B 4. A 5. A 6. B 7. B 8. B 9. A 10. B

Chapter Seven

7. Relation with himself

7.1 Learning to learn

A key competence in both daily and professional settings is perseverance in continuing education. It is, therefore, essential to define a personal ongoing learning method. Motivation mainly stems from the need to constantly improve personal knowledge and skills. To this end, awareness of the importance of being competitive by always knowing the latest developments is essential especially in the professional setting. Being updated means aligning the learning goals with the evolving changes. However, the intellectual pleasure of continuously learning new things should also be considered. Indeed, the person who is capable of learning delights in acquiring new information. Moreover, he has a personal learning method, is aware of the challenges one might encounter when learning new things, and knows how to face such difficulties. In order to learn, one must be capable of self-evaluation, be aware of personal strengths and weaknesses, and identify personal interests and needs.

Why is it important to learn? Learning means acquiring ever-new knowledge necessary to carry out the professional tasks required. Such knowledge can be described as constituted by the following components: a) Informative, direct acquisition of notions (RUL) b) Critical, the ability to organize both analysis and synthesis of notions learnt, to express evaluations concerning certain opinions, and to organize the information acquired by key concepts and their classification according to both general and detailed links (EG) c) Applicative, the ability to apply the notions learnt and to critically process practical situations (EG°). It is also advisable to perform a verification phase designed to compare the goals attained and those desired. Table 7.1 is relative to the above-mentioned components while the method is often called RULEG RUL+EG). It is interesting to consider the Dublin Descriptors, as parts of the formation, particularly in the field of Engineering Education such indicators are today widely used in engineering education and state that the student has to reach the following goals, during his/her education:

I. Knowledge and understanding
II. Applying knowledge and understanding
III. Making judgements
IV. Communication skills
V. Learning skills.

Table 7.1 The components of the RULEG configuration

No.	Component	Name	Abbreviation
1	Informative	Rule	RUL
2	Critical	Complete example	EG
3	Applicative	Incomplete example	EG°

It can be interesting the comparison between the above-mentioned three components of the knowledge and the Dublin Descriptors: (a) In the Dublin's Descriptors the knowledge (informative part, RUL) and the comprehension (critical EG) are considered together; (b) "Makin judgements" can be considered a part of the comprehension ability; (c) The "applying

knowledge and understanding" ability of the Dublin's Descriptors can be regarded as equivalent to the applicative part (EG°); (d) Communication and learning skills, with knowledge, comprehension and applicative aspects, could be considered as arguments to be directly taught, in specific courses, or, at least, in on purpose part of other courses. As example, Table 7.2 represents the proposal of a specific course "Communication" for bachelor degree, with comparison of the Dublin's Descriptors and the RULEG method.

Table 7.2 Proposal of a specific course "Communication" for bachelor degree, with comparison of the Dublin's Descriptors and the RULEG method

Dublin's descriptors	Parts of RULEG Configuration	Example of contents
Knowledge and comprehension ability	Knowledge (informative) RUL	Logical schema of communication and individuation of fundamental problems
	Comprehension (critical) EG	Ability to recognize the role of the communication in a given problem
Knowledge and comprehension ability Applied	Application (applicative) EG	Apply the above mentioned parts to a given simple practical situation

As further example, Table 7.3 represents the proposal of a specific course "Communication" for master degree, with comparison of the Dublin's Descriptors and the RULEG method. Learning to learn means knowing the miscellaneous learning methods, styles and approaches. Each person has a personal learning method. Feasible methods include: (a) Self-learning, based, for instance, on reading books and magazines, on consulting websites, on participating in conferences and congresses (b) Institutionalized, especially centered on attending courses organized by the various institutions the subject considers landmarks. (c) Occupational (learning by doing), which allows to develop skills beyond their current limitations, in the workplace, a stimulating and also challenging context. Additional learning methods: (a) Rapid reading techniques, which allow to acquire more information in the same length of time, (b) Writing, taking notes, drawing up conceptual maps. This makes it easier to identify gaps in the topic studied, and allows to better clarify ideas, (c) Identify objectives and key concepts, bonds and hierarchies between concepts, besides examples, the practical application, (d) Identify information sources by evaluating content reliability, (e) Create an archive, hardcopy and/or electronic, to check their constant validity in the framework of personal awareness.

Table 7.3 Proposal of a specific course "Communication" for master degree, with comparison of the Dublin's Descriptors and the RULEG method

Dublin's descriptors	Parts of RULEG configuration	Example of contents
Knowledge and comprehension ability	Knowledge (informative) RUL	Structuring a general communication
	Comprehension (critical) EG	Ability to recognize the steps of the communication in specific cases
Knowledge and	Application (applicative)	Realize a written

comprehension ability applied	EG°	communication and the correspondent oral presentation

Staying up to date, therefore, is very important for an engineer, as for all professionals, and in the field of Engineering, this is often called Continuing Engineering Education. We can observe in Fig. 7.1 the performance over time of the training objectives (as mentioned earlier, often known as "terminal behavior") required and effective throughout professional life. The fundamental goal of Continuing Education is to keep the sum of competencies of an individual appropriate in time and always relevant to the demands of scientific-technical evolution. Two essential forms of Continuing Education are characterized by differing trends: self-teaching, which is continuous, and institution-based, which is occasional. The latter is characterized by generally shorter training schedules, which gives rise to the need for a stringent schedule of Continuing Education courses. In some considerations about the Continuing Engineering Education, sometimes called Permanent Education.

7.2 **Problem solving**

The problem solving can be defined as the ability to recognize and analyze problems aiming at defining targeted solutions. In the current scene of great changes, organizations are often required to carry out their activities in situations that are often unforeseen, and which demand a proactive, rather than reactive, behavioral approach. In a "fluid" context, such as the currentone, certain habitual activities often either prevent or do not facilitate proper problem-solving as they are outdated. Identifying problems, defining and implementing effective solutions, even adopting innovative strategies, is the core process of problem-solving. It is important to define what to do (strategy), and to be capable of identifying the causes of the problem in order to eliminate and/or reduce negative effects by choosing possible alternatives. At this point it is advisable to identify the necessary learning processes, and it is also essential to define information organization models that can later be used in other circumstances. Awareness of the context and of the process that is unfolding is important, besides knowledge of organization and problem-solving methods.
After identifying the "problem", and if its high degree of complexity is ascertained, an analysis procedure should be adopted to divide it into a certain number of smaller problems.

It must be said that solutions can generally be identified in two steps: (a) Known solutions, which are part of the general legacy of knowledge (b) New solutions that can be triggered by identifying and applying innovative methods. At this point, a choice of applicable solutions, identified based on the related strengths and weaknesses can be formulated for each specific problem. The important role of problem solving also in daily life is confirmed by the observation that often even in small everyday things, many people do not know how to act, precisely because they do not know how to identify the problem. This often starts with the inability to deal with the "what" to do, that is, the problem. And in these cases too often you see trying to deal with the "how". Thinking about how to deal with a problem without having clear, what the problem is, means making it very difficult to get to the solution.

It is also clear that the formalization of the problem correctly in the field of engineering is essential to arrive at the solution. For a teacher, above all, but not only, of engineering it is then very important to identify the problem. There are two reasons for this. It is important, in

explaining engineering problems, to make it clear to pupils which elements of a problem are important and which are less important. In addition, in the assessment of learning it is important that the teacher is able to identify the essential knowledge and those less essential for the evaluation of the student.

7.3 **Digital thinking**

Digital devices have spread rapidly in a relatively short time, and any organization that might present deficiencies in this regard would not be acceptable. Awareness of the opportunity offered by digital devices is, therefore, essential, besides their informed and appropriate use. This means being proactive towards them and not experiencing them passively or, worse, hindering their implementation by saying, as at times we hear people remark, but was it necessary? or Wasn't everything all right before? Hence the need to clearly understand the principles, knowhow digital devices function, and their rational and correct use. This generates the ability to perceive the characteristics of a context related to the use of digital devices, having a clear idea of their potential but also of the related problems and inconveniences. This also triggers the need for high standard technical preparation designed to make the most of digital devices. However, this must not be distinguished from their ethical use. It is important to note that every technical innovation increases the power of humans and, therefore, presents ambivalent features. Subsequently, especially digital technologies require particular care to avoid any harmful use for both the person and others.

7.4 Planning

Planning means being capable of coordinating both personal work and the work of others, using time and resources to obtain effective results. Planning signifies being familiar with the basics in order to manage activities and resources. In fact, the objective of obtaining effective results cannot disregard the proper and rationale use of both time and resources. Planning is linked to many other aspects of Soft Skills. For instance, defining a goal, as advised by the problem-solving process, is essential for planning. However, after establishing the goal, in this case we must take an additional step and "superimpose" a time axis to activities established by problem-solving, indicating not only the "what" but also the "how" to achieve the various objectives. To date, only too often we see people, even those holding positions of responsibility, who lack a clear idea of the difference between what should be done immediately and what can be postponed. Subsequently, they waste time on pointless things (and words!). Eisenhower's matrix is important to this end (see also the chapter "Flexibility"). It distinguishes urgent and non-urgent, important and unimportant items. It is also rumored that the former President of the United States used this matrix to perform a huge amount of work. In fact, the matrix classifies all things to be done, based on their importance and urgency, according to the following categories:

(a) Important and urgent: these are the most critical items as they must be implemented rapidly and, despite their urgency, it is not easy to evaluate them as required (Do first) (b) Important and non-urgent: they must be weighed, and there is time for this; hence, these items require and deserve the utmost attention (Do later), (c) Unimportant and urgent: they can be delegated (delegate) and (d) Unimportant and non-urgent: they can be postponed indefinitely (Delete). Since nobody generally works alone, it is very important (and not always easy) to coordinate personal planning with that of colleagues and collaborators. The importance of knowing how to plan every activity by establishing hierarchies of things to be done is never emphasized enough.

7.5 **Result orientation**

When starting and implementing any activity, it is essential to always have a clear mental picture of the goal to be achieved. In this regard, determination and perseverance are of the utmost importance, besides effective performance of the tasks. It can be helpful to define a Strategy (what has to be done, which means doing the right thing) and a Tactical Plan (how to do it, which means doing things efficiently) to identify possible issues and subsequent feasible solutions to achieve the intended result. Some consideration is also necessary to estimate how often the right things are done (efficacy) and how often these right things are done well (efficiently). Given that the following points are possible:

- Do the right things well (DRTW), for example, to correctly complete the chosen task within the estimated time, and to precisely and promptly provide the information required
- Do the wrong things well (DWTW), for example, correctly and rapidly perform a pointless task but present a well written report on a topic of scarce interest
- Do the right things poorly (DRTP), for instance, perform the chosen work superficially and slowly; present an important report containing inaccurate information
- Do the wrong things poorly (DWTP), for instance, suspend urgent work to perform a pointless activity without enthusiasm; present a poorly written report on a topic of scarce importance.

For further details on this topic, refer to the chapter “Flexibility” in Eisenhower’s matrix item that underscores how to best manage the various activities. Clear ideas and lucidity are characteristics that should always underpin result-oriented decisions and behaviors. Interesting can be some considerations about the logical connections between Result orientation and other Soft Skills, in particular Problem solving and Planning. All three of these soft skills are related to the behavior in the face of a problem. In Fig. 7.2, is represented a general logical about the reciprocal interrelations between the above mentioned Soft Skills. The starting point, in face of a general problem, can be considered the correct formalization of the problem (what to do, i.e. clarify the problem) by identification of the wanted goals. Later, the Planning is corresponding to the “how to do”, i.e. to the correct and complete individuation of the procedures necessary to

reach the wanted goals.

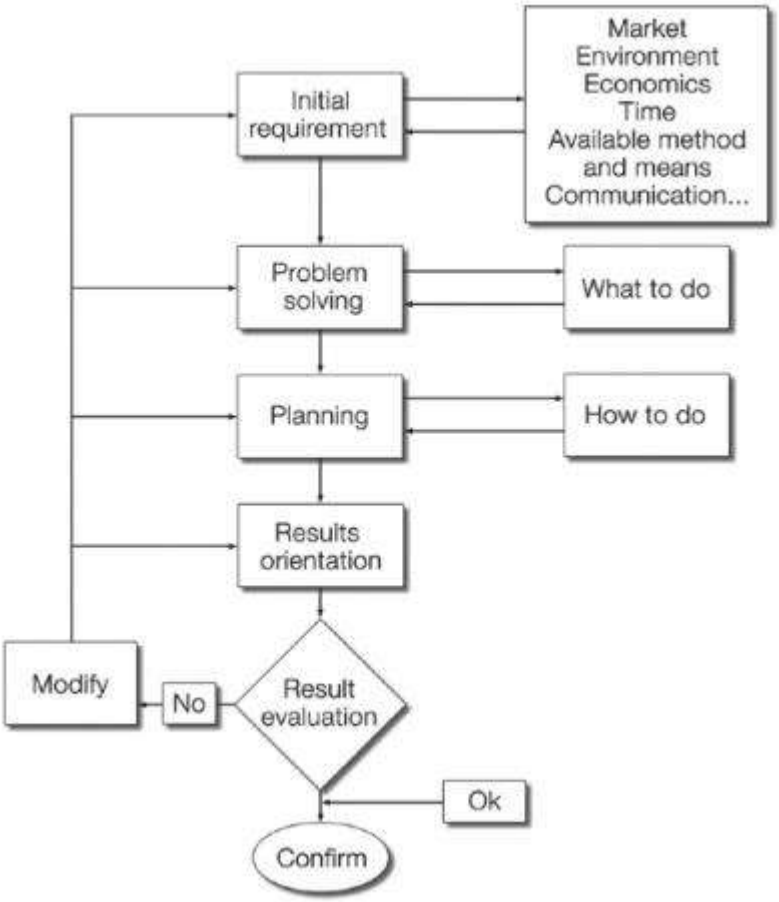

Fig. 7.2 Integration between problem solving, planning, result orientation

After the individuation of the solutions, the Result orientation is corresponding to clarify of the results reached in the previous step. The results of the problem should be evaluated in relation to some established criteria: the output of this step is the confirmation or the need for a change. Such operation can be relative to the Result orientation (new criteria to clarify the results), to the Planning (new procedures to apply, with the aim to reach the wanted goal), or to the Problem solving (new criteria to formalize the problem).

7.6 **Awareness**

In this field, awareness can be defined as the ability to criticize self, with the aim of adopting a balanced position between two opposite situations or feelings or mental states. The ancient Romans used to say, “Virtue lies in the middle”. This saying is just as true today, especially in the field of engineering. In particular, it can be said that a virtue or, in any case, balanced behavior, when extreme, can become (or always becomes) a defect, sometimes with very negative results, especially in a professional setting. Table 7.4 shows a series of virtues (in the first column) and of vices (in the second column), which correspond to a virtue taken to the extreme. Confidence is a great virtue that can help overcome many difficulties, but when taken to the extreme, it can turn into a sense of infallibility, even a power trip, which can lead one to underestimate difficulties and to overestimate personal strength. Feelings of infallibility and

power trips often underpin irrational behavior, often with tragic consequences. Fast decision-making, fast acting and the ability not to waste time in non-constructive hesitation, when taken to the extreme, turn into hasty and thoughtless actions. Often, by doing this, time is wasted, instead of being saved, as things done in this sloppy manner are either wrong or incomplete, and must often be carried out again.

Table 7.4 Balanced behaviors that can become negative

Balanced behavior	Negative behavior
Confidence	A sense of infallibility
Quickness	Over hastiness
Sharp wit	Abrasiveness
Alertness	Narrow focus
Dedication	Workaholism
Control	Inflexibility
Courage	Foolhardiness
Perseverance	Resistance to change
Charm	Manipulation
Ambition	Coercion
Power	Autocracy
Flexibility	Ambivalence

A sense of humor, inoffensive irony or a joke can often soften tension in a work environment, defusing critical situations. When it is excessive, the sense of humor becomes sarcasm and teasing, which often ridicules and embarrasses the target. While sharp and inoffensive irony improves the environment of a workplace, sarcasm, which is offensive to the target, makes the work environment untenable, worsening the results achieved by the team. Vigilance, attention, constant and discreet tracking of what our co-workers are doing is a precious virtue, which increases team performance. However, if this behavior becomes excessive, it turns into an obsessive breathing down collaborators' necks, creating tension, which is very negative to the state of mind of those working and, ultimately, to the quality and overall quantity of the work carried out. Devotion to work is a commendable virtue, though it is, unfortunately, very rare today. Excessive devotion becomes a sort of work-addiction that, as all dependencies, can become very negative, even pathological. The ability to lead is a valuable and indispensable virtue, especially for a manager who has (or should have!) the task of identifying each members' talents, and of assigning tasks that match these talents in order to maximize teamwork. The ability to issue orders, when exaggerated, becomes inflexibility that does not tolerate the slightest mistake, and is only capable of creating a climate of fear in the work environment. We can imagine how "useful" this would be for team results. Courage is a virtue that allows us not to fear obstacles and challenges but, taken to excessive levels, it turns into madness that leads to useless risk-taking, with consequences that can be easily imagined. Perseverance is positive behavior, which helps us not to lose faith and not to be discouraged by difficulties and by inevitable failures. When extreme, it means being stubbornly attached to one's own ideas, not being willing to change attitude or behavior, being "hostage" of one's habits. Charm, within appropriate limits, can be positive and contribute to creating a pleasant work environment. If, however, a person "takes advantage" of their charm to manipulate others and impose their will, then charm becomes a questionable attitude. Ambition helps us set higher goals and creates a

spring that helps us improve. Too much ambition, however, becomes a compulsion, in other words, it runs the risk of becoming coercive or oppressive to those around us.

Power is essential in order to act decisively, but too much of it becomes authoritarianism, which is negative in terms of achieving harmony in relationships with others. Finally, flexibility is a virtue that allows us to accept change, and to easily adapt to it. However, as stated in Chap. 4, an excess of flexibility becomes ambivalence, the condition in which we feel torn between two antithetic impulses, often both positive and negative, towards the same object. The negative effects of this situation, which greatly hinders any objective decision, are clear. The comment to Table 7.4 underscores the importance of balance that should come from awareness and from objective self-criticism of one's behavior. A simple observation of the table immediately brings to mind how, in daily life, we often meet people who, despite being reputable and valuable in other ways, have no sense of measure. Through excess, they are capable of turning virtues into defects, which can make life harder for those around them. Likewise, it should be pointed out that the environment of many workplaces could be different (and better), especially but not only, in the engineering field, if everyone were inspired by the table in question, and studied it with a sincerely self-critical spirit. We can say that we have all, unfortunately, had some direct experience of teachers at all levels who, had clearly never seen… the table in this chapter. We can only imagine how this must have impaired the results of the teaching imparted.

7.7 **Personal branding**

It is essential to know oneself and to be aware of the know-how possessed. Indeed, as also discussed in the various chapters of this book, awareness of personal skills is essential for success in the occupational world. Skills can be divided into two large categories. Hard ones, which refer to the profession's specific knowhow, are generally discussed with sufficient detail in official training institutions, such as universities, particularly scientific and technical ones, which already provide thorough education and training. Instead, concerning Soft Skills discussed in this book, they are scarcely included in institutional training. Indeed, their importance is growing, whether in the professional scene or in teaching or in daily life. The goal for each of the soft skills discussed in this module is the behavior triggered by reading the module. Since a person's actions and behavior closely depend on the knowledge acquired, the combination of these two factors is often called 'terminal behavior'. Terminal behavior relative to each Soft Skill is then analyzed, identifying, for each one, the basic knowledge that constitutes terminal behavior. One question or, in some cases more than one question, concerns each of these basic knowledge factors. The answers are assigned with a scale based on the Net Promoter Score (NPS), a management tool designed to especially evaluate the loyalty of a client towards a product or a service. It has been modified by the authors to meet specific needs. The scale of the original NPS system has a range of 0–10, and designates a score of 0–6 to detractors, 7–8 to passive subjects, and 9–10 to sponsors.

Table 7.5 Evaluation and result qualification of the prepared test

Evaluation	Resulting qualifcation0 -
0 – 4	Job holder
5 – 6	Actual best version of yourself
7 – 8	Unique person
9 – 10	Difference maker

Discuss the following in class (Rate 0 – 10) and how to develop a good knowledge of one's.

1. In the professional field, I always try to assess the consequences of my actions, while making decisions quickly and trying to set higher goals, so as to continuously improve the work.
2. In the professional field, I am an ironic and charming person, in order to create a more pleasant atmosphere with colleagues and/or collaborators.
3. In the professional field, I am able to act decisively, but without excessive authoritarism
4. In the professional field, I have dedication to my work, even if I take breaks, dedicating myself to my free time.
5. In the professional field, I am a person who can identify the talent of others and I know how to use it in order to put it in my work team to achieve a goal.
6. In the professional field, I am not afraid of obstacles and I do not allow myself to be discouraged by difficulties, while avoiding unnecessary risks.
7. In the professional field, I am a person who, while maintaining perseverance, willingly accepts change, easily adapting to every situation.

Multiple choice questions

1. Which one of the following is a host of skills needed in learning to learn?
   a) organizing your own learning,
   b) managing your time,
   c) identifying opportunities,
   d) being able to deal with obstacles,
   e) looking for and using others for support
   f) all

2. which one of the following is not needed to learn
   a) motivation to learn
   b) to be aware of your learning
   c) to be able to organize your learning
   d) to reflect on your learning
   e) to asses yourself f) other people g) none
3. The big advantage of organizing your own learning is that you don't have to follow what others have planned for you – you can do it in your favorite way
   a) True b) False
4. Which of the following is true about a person capable of learning?
   a) He has a personal learning method,
   b) He is aware of the challenges one might encounter when learning new things, and knows how to face such difficulties.
   c) He is capable of self-evaluation,
   d) He is aware of personal strengths and weaknesses,
   e) He able to identify personal interests and needs
   f) All are true

5. Which one of the following is not a core process of problem-solving?

a) Identifying problems,
b) defining and implementing effective solutions
c) adopting innovative strategies
d) all
e) none

6. Thinking about how to deal with a problem, without having clear what the problem is,is means making it very difficult to get to the solution
   a) False b) True

7. Digital devices have spread rapidly in a relatively short time, and any organization that might present deficiencies in this regard would not be acceptable
   a) True b) False
8. Which one is correct statement
   a) Planning means being capable of coordinating both personal work and the work of others, using time and resources to obtain effective results.
   b) Planning signifies being familiar with the basics in order to manage activities and resources.
   c) Planning is linked to many other aspects of Soft Skills. For instance, defining a goal, as advised by the problem-solving process, is essential for planning.
   d) All are correct

9. Which statement is not true about confidence
   a) Confidence is a great virtue
   b) Confidence can help overcome many difficulties,
   c) Confidence taken to the extreme do not have any problem
   d) Confidence taken to the extreme can turn into a sense of infallibility

10. Which statement is correct
    a) awareness can be defined as the ability to criticize self, with the aim of adopting a balanced position between two opposite situations or feelings or mental states.
    b) “Virtue lies in the middle”
    c) balanced behavior is virtue
    d) all

Answers

1. F 2. G 3. A 4. F 5. E 6. B 7. A 8. D 9. C 10. D

Review questions

1) As engineers, what do we need to know in advance to learn new thins (or for life long learning)
2) What is learning ? discuss the components of learning
3) Digital technology require particular care to avoid any harmful use for both the person and others. Discuss the harmful uses of digital technology you may be aware of.

4) What do we mean by planning ? why planning ?
5) How do you relate planning with Eisenhower matrix, Discuss
6) Define awareness

Chapter Eight

8. Imagination and creativity

Ability to create something that did not exist previously (i.e. disrupting innovation).

8.1 **Introduction**

Imagination and Creativity are concepts that, despite a subtle difference in meaning, are characterized by considerable similarity. By 'imagination' we mean the ability to conceptualize, identify and suggest ideas, solutions and new concepts capable of triggering a disruptive revolution in both markets and life. Creativity, on the other hand, leads to the transformation of ideas conceived through imagination, modifying the conceived and implemented innovations in order to improve them even significantly. In terms of design theory, we can respectively speak of design for innovation (characterized by the creation of products that constitute a "leap forward", or a discontinuity in markets) and of design for change (characterized by improvements to already existing products). In both cases, it means formalizing a certain function (innovative or already known, respectively) and identifying possible solutions that carry them out. The "best" of these must then be chosen, the one that carries out the intended function most consistently with the initial needs.

8.2. **General steps**

The possible solutions can, generally, be identified by implementing the following steps. The general objective is to identify the "best" solution to a given problem. Hence the need to recognize the possible solutions to the problem at hand. This can be carried out by following two steps in succession: (a) Existing solutions, drawn from the individual's background knowledge, from the state of the art, from the indications required and/or received, from research carried out, for example, on the bibliography and/or the sitography. This step, as stated, especially concerns creativity, as it specifically consists in identifying improvements to existing solutions. These improvements can relate to both the solution per se (product improvement) and to the way of obtaining it (process improvement) (b) Innovative solutions drawn, for example, from the subject's imagination (imagination is an important trait even in tech jobs!), from heritage (either taken as is or critically assessed), and from heuristic methods. Heuristics (from the Greek heurisko, literally "discover" or "find") is a part of epistemology and of the scientific research method that is involved in favoring access to new theoretical development, new empirical discoveries and new technologies. Once all the solutions to the problem have been identified, the next step is to choose the one that carries out the required function in the most satisfactory manner. Having hypothesized A, B, and C…, the various solutions, and 1, 2, 3… the different aspects revealed by functional analysis, the choice can be made with tables such as the one in Table 8.1. The points in the table identify, with a numeric value or with an attribute, the value of the generic solution, compared to the generic aspect of the function. If, as is often the case, all aspects do not have the same weight, this can be introduced by adding the following line to the matrix:

P1	P2	P3	…	…	…

8.3 **Daily life**

The following is an example. The task was to identify the person best suited to carry out a specific task. After identifying some people, of whom A, B, and C are three examples, the aspects that were deemed significant were the ones in the first column of Table 8.2, while the second presents the weight attributed to each aspect. Referring to Table 8.2, Person A is the "best" fit: obviously, in this case, considering the limited number of people and aspects, the choice could have been made more directly. This is merely an example. It is clear that, if there were a higher number of people and of aspects, the use of the table would have allowed a more unbiased choice, with an innovative approach compared to a direct choice between few people. Thus, the shortlist to choose from can be wider.

8.4 **Engineering**

An innovative approach to a technical problem, instead of doing things the way they have always been done, can be to use specific methods, a few of which are exemplified below.

Table 8.1 General matrix for choice of solution

	Aspect 1	Aspect 2	Aspect 3
Solution A	VA1	VA2	VA3
Solution B	VB1	VB2	VB3
Solution C	VC1	VC2	VC3

Table 8.2 Selection table for the most appropriate person to carry out a specific task

Aspects	Weight	Individual A	Individual B	Individual C	Weight Individual A	Weight individual B	Weight individual C
Age	1	3	2	3	3	2	3
Relationship With the person	1	3	2	3	3	2	3
Legal competencies	0.8	3	2	0	2.4	2.4	0
Living in X	0.5	3	2	1	1.5	1.5	0.5
Commitment compatibility	1	2	2	1	2	1	1

8.4.1 **Historical heritage**

A critical analysis of the historical heritage can be a source of interesting innovative ideas. Suffice to think that the Conservatoire in Paris, opened in 1794, was suggested a century before by Descartes, with the aim of presenting machines in chronological order, from the most ancient to the most modern at the time, to technicians, in order to stimulate creativity and thus encourage innovation. Descartes, therefore, had conceived the embryonic idea of a database with the tools he had at the time. To this end, a digitalized archive of implemented or even only conceptualized ideas would be interesting. Such an archive would be no minor instrument for innovation, based on a critical analysis of ideas from the past, actualizing them, for example with modern materials and/or technologies.

8.4.2 **Traditional heuristic methods**

Innovative solutions can emerge from the consideration, for example, of physical phenomena. We can consider designing a technical product by changing the physical phenomenon used to date to carry out the function. Constructive solutions, which differ from those known, can also emerge from, for example, geometrical, kinematic and dynamic variations. Table 8.3 presents a few examples. As example, Fig. 8.2 is relative to some principles realizing the transformation of the continue rotating motion into alternative translation motion. The analysis could be continued. For example, if the third principle of the figure is chosen, the component functions that can be highlighted, among others, are the following: (a) Contact between moving and moved members; (b) Return of the moved member. The second one can be realized by means of weight (Fig. 8.3), by means of spring (Fig. 8.4), or by means of gas pressure (Fig. 8.5). Another possible variation can be to change the configuration of surfaces around functional surfaces, for example by changing materials and/or technological processes. Figure 8.6 shows an example of variation in the configuration of a bell-crank lever, which can be considered the materialization of three holes having a given diameter and a given center-to-center distance, and arranged according to a specific angle. It can be seen that the surfaces of the holes can be "connected" by a certain quantity of material, shaped according to specific technological procedures.

Table 8.3 Possibility for different variations

Geometry	Forms Combination of forms Structural link Number Position Orientation …
Kinematics	Direction of motion Reciprocal positioning of mobile and fixed points Position and number of fixed surfaces Position and number of mobile surfaces Type of trajectory …
Dynamics (for example, force generation)	Weight Cable or chain traction Bar thrust Spring thrust Archimedes' thrust Fluid-dynamic pressure Friction Electrostatic attraction Magnetic attraction …

For example, in the figure, the technological processes used can be, from top to bottom, respectively:

a) From an indefinite semi-finished product, for example "cutting out" a portion of sheet metal;
b) By fusing or shaping plastic, depending on the chosen material (not all materials are suitable for both technological procedures mentioned);
c) By connecting parts obtained from indefinite semi-finished products (in the case at hand, the piece is obtained from three sections of pipe and from two parts of sheet metal, welded together);
d) From an indefinite semi-finished product (a similar solution to 1), where the sheet metal portion has a different shape).

For somewhat complex technical products, especially if made up of multiple pieces, a possible criterium to identify innovative solutions could be the following steps:

i. Identify the general function carried out by the overall product
ii. Identify the component functions by analyzing the general function
iii. Identify constructive solutions for the component functions
iv. Identify constructive solutions related to the general function, as a congruent synthesis of the solutions relative to the component functions.

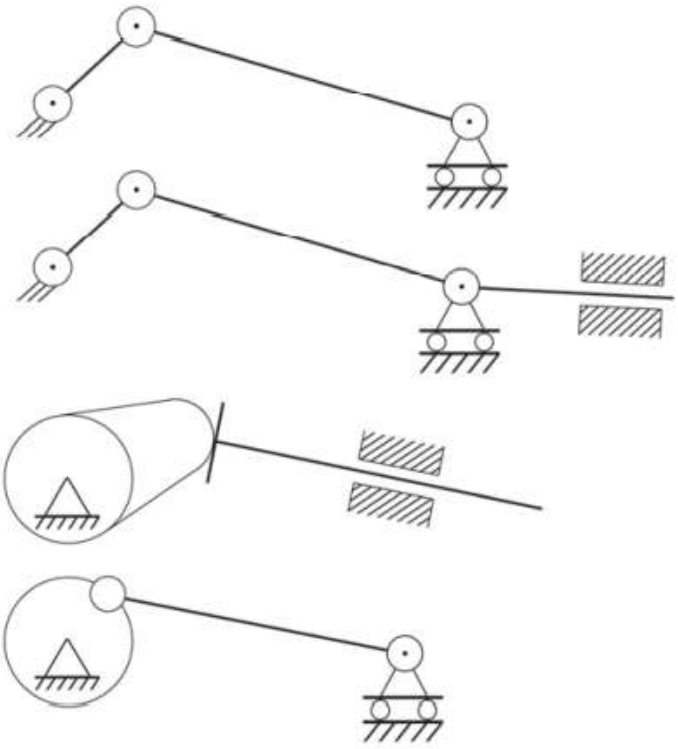

Fig. 8.2 Some principles realizing the transformation of the continue rotating motion into alternative translation motion

For example, if we need to design a cylindrical hinge as per Fig. 8.7: a rigid horizontal axis is secured to a wall and a vertical arm is bound to it with a rotoidal joint. The movements this arm can make are only rotations around the fixed axis, as axial sliding must be prevented. The following component functions issue from an analysis of the general function:

a) Lock the axis
b) Allow the arm to rotate in relation to the axis
c) Prevent axial shifts of the arm.

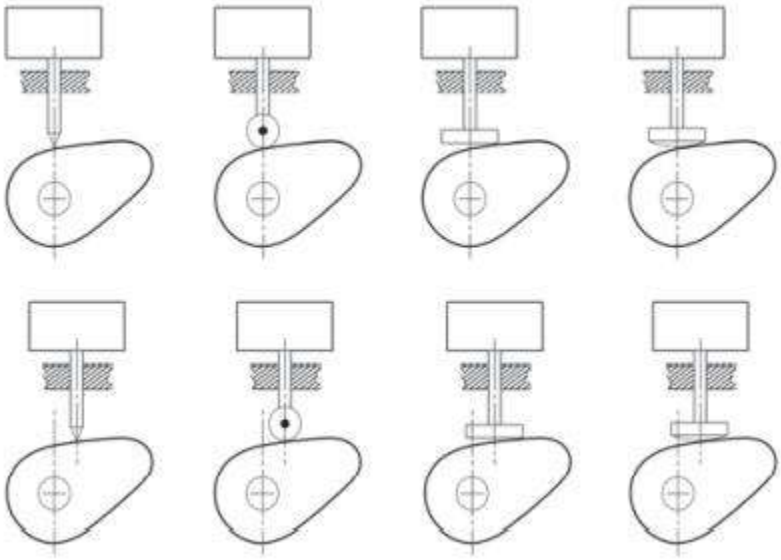

Fig. 8.3 Principles with the return of the moved member by weight

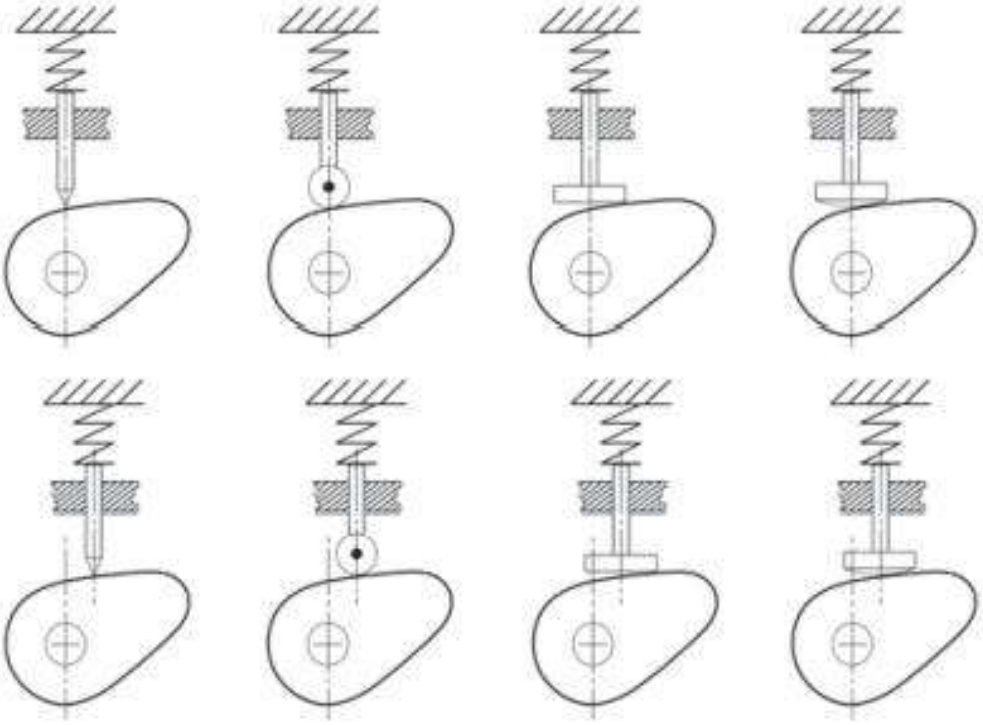

Fig. 8.4 Principles with the return of the moved member by spring

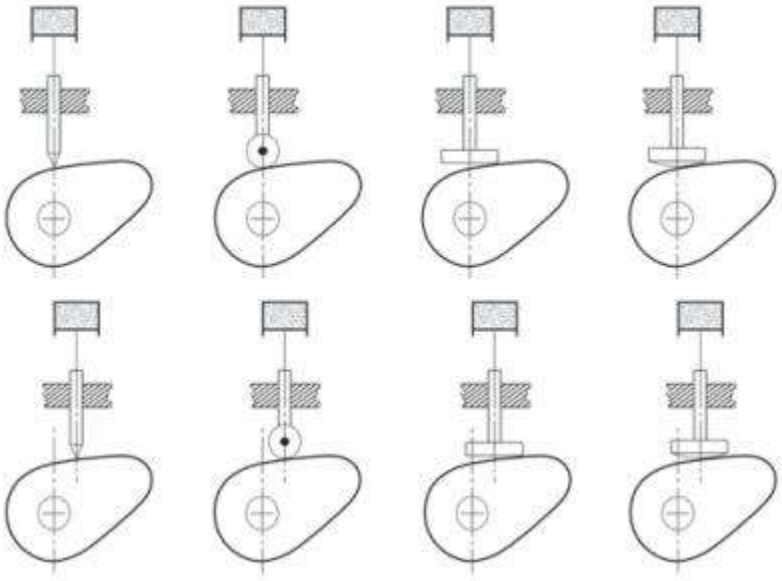

Fig. 8.5 Principles with the return of the moved member by gas pressure

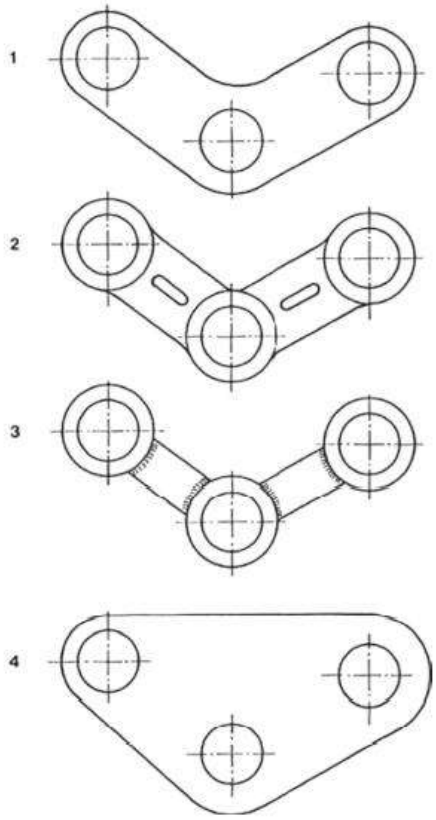

Fig. 8.6 Various configurations of a bell-crank lever. Courtesy of CittaStudi

A rational and, therefore, innovative approach might be to find, for each component function, the construction principles/ solutions that can be used to carry it out, rather than doing what has always been done. Table 8.4 provides an example. The solution for the mechanism is a congruent synthesis of a single solution for each function (Fig. 8.8). The first overall solution to the above Fig. 8.8 is described below:

a) Axis lock: through threaded shaft with relief to allow securing on the surface with highest diameter; note that a cylindrical fat head pin is used to allow tightening
b) Allow rotations: roller and cage assembly
c) Prevent axial sliding of the arm: sliding to the right is prevented by the fixed wall, and to the left by the pin head.

The second comprehensive solution is given below:

i. Axis lock: through a threaded shaft secured to incomplete threads; the stem head is cylindrical, with a hexagonal groove for tightening
ii. Allow rotation: through direct contact between the smooth part of the stem and the arm bore (c) Prevent axial sliding: sliding to the right is prevented by the fixed wall, and to the left by the pin head.

Finally, the third solution is described below:

a) Axis lock: by interference connection onto a stem with smaller diameter
b) Allow rotations: two smooth fanged bearings mounted in opposite directions
c) Prevent axial sliding: sliding to the right is prevented by the flange of the right bearing, which leans on the fixed wall;

Sliding to the left is prevented by the flange of the left bearing, which leans on the pin head.
These are only three examples: there could be many more by combining the solutions exemplified in Table 8.4.

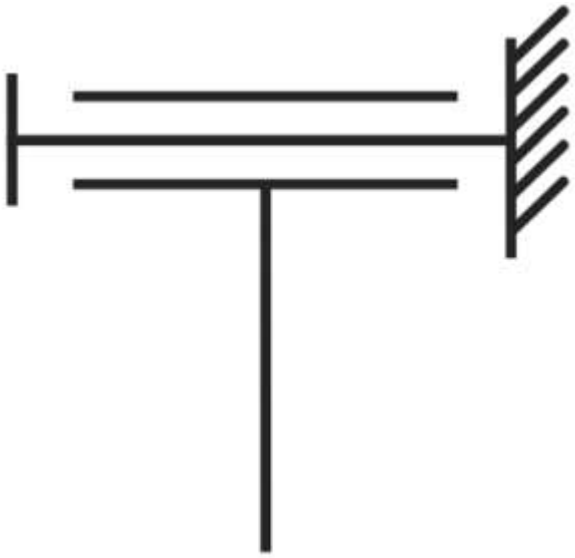

Fig. 8.7 A diagram of the mechanism to be designed.

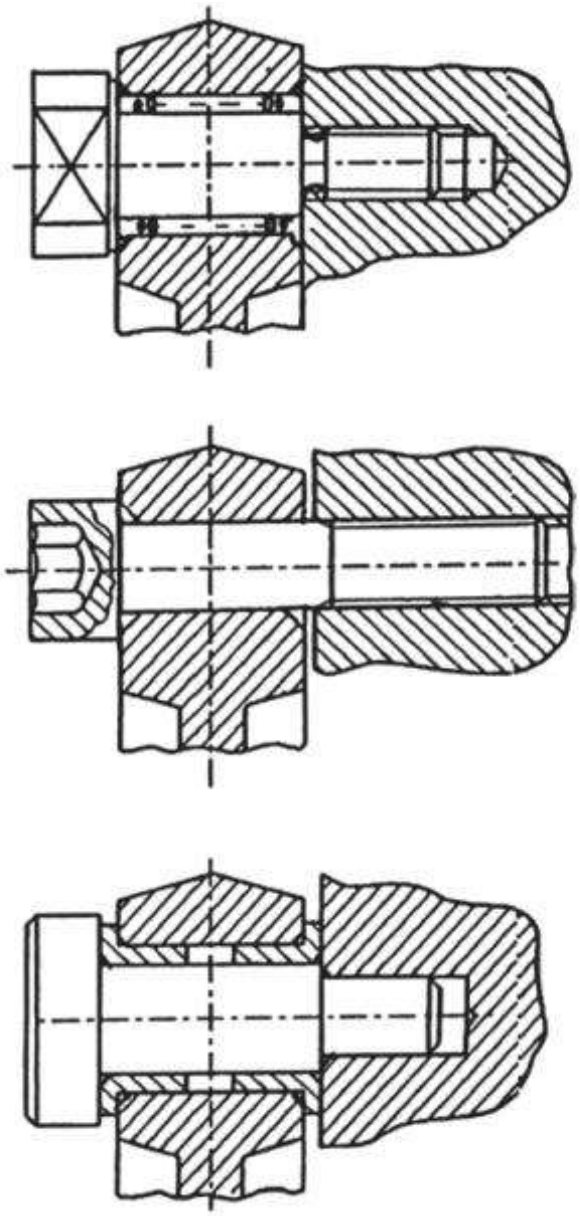

Fig. 8.8 Three examples of an overall solution for the mechanism, through a congruent synthesis of a single solution for each function.

Table 8.4 Examples of construction principles/solutions for each component function mentioned above

Component functions	Examples of possible solutions
Lock the axis	(a) Pressure (b) Threaded connection secured to incomplete threads (c) Threaded connection secured to a surface perpendicular to the axis and relief (d) Welding (e) Gluing (f) …
Allow rotations	(a) Direct contact (b) Rolling bearing (c) Journal bearing (d) Elastic bearing (e) Roller and cage assembly (f) …
Prevent axial sliding	(a) Cheese head of part (b) Hexagon head (c) Cylindrical fat head (d) Expansion ring (e) Diametral pin (f) …

Multiple choice questions

1. By 'imagination' we mean
   a) the ability to conceptualize,
   b) the ability to identify and suggest ideas, solutions
   c) ability to new concepts capable of triggering a disruptive revolution in both markets and life
   d) all
2. Creativity leads to the transformation of ideas conceived through imagination, modifying the conceived and implemented innovations in order to improve them even significantly
   a) True b) False

3. A critical analysis of the historical heritage can not be a source of interesting innovative ideas
   a) True b) False

4. Which one is true statement
   a) Innovative solutions can emerge from the consideration, for example, of physical phenomena.
   b) It is possible to consider designing a technical product by changing the physical phenomenon used to date to carry out the function

c) Constructive solutions, which differ from those known, can also emerge from, for example, geometrical, kinematic and dynamic variations
d) All

5. Which one is not true about existing solutions,
   a) drawn from the individual's background knowledge,
   b) drawn from the state of the art,
   c) drawn from the indications required and/or received,
   d) drawn from research carried out, for example, on the bibliography
   e) drawn from the subjects imagination
6. which one is not correct about innovative solutions
   a) Innovative solutions drawn from the subject's imagination (imagination is an important trait even in tech jobs!),
   b) Innovative solutions are drawn from heritage (either taken as is or critically assessed), and from heuristic methods.
   c) Innovative solutions are drawn from the scientific research method that is involved in favoring access to new theoretical development, new empirical discoveries and new technologies
   d) Innovative solutions are drawn the individual's background knowledge

Answers

1. D 2. A 3. B 4. D 5. E 6. D

Review questions

1) Discuss the difference between imagination and creativity
2) Discuss among your group the important aspects you might consider to identify a person best suited to carry out a specific task. For instance consider "product design" as a task
3) Discuss how historical heritage and traditional heuristic methods can be relevant for innovation
4) Discuss innovation

Chapter Nine

9. Human aspects of technology

9.1 Preliminary concepts

Scientific research is an activity that, even in its embryonic form, man has performed since the beginning of time. Man has always attempted to explain the natural phenomena he witnessed, and soon started formalizing them. On the other hand, man immediately provided evidence of his technical skills by creating artifacts to help him perform his daily activities. The two activities, "scientist" and "technician", were initially totally disconnected: scientists carried out their research, while technicians created their artifacts with little or no consideration for the results of research. Carpenters in Ancient Greece, for example, could build excellent ships but, most probably, did not know Archimedes' principle, and could not rationally explain why ships float. However, they knew how to build them well, based on experience.

Only during the Renaissance will technology start using scientific results, and science will use instruments created by technology. Thus technology was born, and progress started accelerating through the developments of the Seventeenth and Eighteenth centuries, in a dizzying crescendo until the present day. For example, progress in clockmaking triggered the need to deal with and delve into dynamic problems, for example relative to oscillation, thus further improving clocks. Another example is the improvement in suction pumps, especially for the extraction of water from mines, which led to the acceleration of studies on problems concerning vacuum, generating further improvements in the construction of pumps.

9.2 Ethical Issues

Scientific research is, in itself, neither good nor bad. Starting from Galileo, it is the process of "reading" the great book of Nature and, therefore, has no specific ethical features. Ethical aspects concern the way it is carried out. For example, research that, despite broadening knowledge, required the sacrifice of human lives would not, of course, be acceptable. Technological development increases the power of man and is, therefore, ambiguous. Here, accordingly, lies the need for an ethical evaluation tool. Technological progress can be examined from many points of view that can, nonetheless, be traced as an initial approximation to the following three ideologies:

1. The ideology of indefinite progress, which starts from the consideration of the cumulative character of progress, thanks to which humanity would proceed towards ever better life statuses, in a limitless progression.
2. The political-revolutionary ideology, according to which progress would lead to one class' domination, which could only be opposed by a new regime of the oppressed class.
3. The critical-catastrophic ideology, according to which progress would irreparably compromise the world and would lead to total alienation of humankind.

All three points of view identify, however extremely, an actual factor, but all three also have their weaknesses. Thus, the ideology of indefinite progress is refuted by many current problems; the political-revolutionary ideology is open to the criticism that violent methods substitute oppressive situations with other oppressive situations, while the critical-catastrophic ideology ends up sanctioning an exasperated fatalism. However, each of them is characterized by the absence of ethical aspects. Hence, the need for a conscience, which aims to identify the dangers

of technological development, underlining, however, the positive points. One necessary consideration is that technological development is a fact: it is impossible to go back as "de-invention" cannot exist, as history can confirm. Technological development, as with everything, has both negative and positive aspects but he has brought great benefits to humanity, both in quantitative and qualitative aspects to life. However, especially in the last century, the technology, used in a not always correct and balanced way, has ended to creating problems of environmental impact. The problem is not solved by "going back" and cancelling the progress, but by introducing the concept of "sustainable progress" of technology. In other words, the technology, correctly used, also provides the means to prevent and combat the environmental impact. Beyond these considerations, positive and negative aspects of technology are now mentioned.

9.3 **Positive aspects of technological progress on mankind**

Technology, precisely because it is based on the application of scientific principles, is an encounter with the laws of nature. Technological development allows to create machines that can relieve humans of some of their work. By carrying out some of the labor that should have been done by humans, they "grant" humans free time, which can then be devoted to cultural elevation. If then man, as unfortunately happens only too often, uses it to debase himself, it is not technology's fault! The great progress of modern medicine would not have been possible without the development of technology: suffice to think of machines and auxiliary instruments for medical professionals. It is not by chance that many Engineering faculties have held degree courses in Biomedical Engineering over the span of very few years. Technology, moreover, can now provide aid to disabled people, who only a few decades ago would have been condemned to be excluded from many activities. One of the authors recalls that years ago, climbing the stairs of the Department, he had to make an effort to keep up with a Ph.D. student: that was no surprise, as the student was one third the age of the author, who was nevertheless surprised to find out that the student had an artificial leg!

9.4 **Negative aspects of technological progress on mankind**

If it is not well managed and, especially, not filtered by an appropriate ethical spirit, technological development can also generate negative issues. We find such an example in the great availability of material goods that, thanks to technological development targeted at excessive consumerism, can drive some individuals towards materialism, towards the excessive accumulation of material goods. It encourages them to consider themselves and others based only on what they possess, in other words, a rationale of having rather than of being prevails, even to the extreme case of idolatry of material possessions. Moreover, the availability of some material goods to people who are not able to use them correctly can cause negative situations, even very negative ones: for example, cars capable of very high performance can be the cause of great trouble in the hands of people who are reckless and/or incapable of understanding their limitations. An example from one of the author's professional experience concerns a vehicle parked by the driver on a slight slope. At a certain point, the vehicle started moving on its own and the driver stepped in front of the car in an effort to stop it. Needless to say, he was run over with dire consequences. If only he had considered the principle of energy conservation and, instead of trying to stop it like that, had jumped back into the car: the injury could have been avoided. This episode confirms the need for users of technological products, in other words, everyone, to have a scientific-technological background, even at a basic level. Those mentioned

above are examples of a questionable or even negative use of technological development, and involve, especially, but not exclusively, the users of technological products.

There are also inherent errors in the creation of technological products, and these especially involve technicians. For example, hastily designed products, perhaps due to superficiality or the urgency to launch them on the market, can create serious problems. One of the authors came across this case in his professional practice. A hoisting machine, due to the hurry to release it on the market, was built by literally “copying” a competitor’s machine. However, due to haste, it had not been perfectly copied, and the machine thus produced experienced the breakage of a part that, in turn, caused a serious injury. Another example from the professional experience of one of the authors involves a high performance vehicle, whose engine compartment hood suddenly opened while in motion, impeding the driver’s visibility. Only the driver’s composure and skill, as well as the slow speed at which he was travelling, prevented an accident. A technical inspection in which the author took part showed that two components, which should have been connected by a screw within the locking mechanism of the engine compartment hood, were not connected at all. The report stated that the screw connection lacked the anti-slackening device and, therefore, it had become loose due to the motion-related vibrations. It was not possible to ascertain if the lack of this device was to be attributed to a design error or to an assembly error.

9.5 **Technological development and environment**

Technological development must still contend with several detractors who are, often, the most avid users of technological products. Some considerations of technological development can be made on the cycles of the product represented in Fig. 9.1. On the top, is represented the linear economy: without recycle, the accumulation of waste becomes bigger and bigger. The figure below, instead, is derived from the Asimov cycle. It concisely represents the life of a technological product, by highlighting the concept of circular economy.

This starts from the project phase, which, by utilizing raw material, consists in the formalization of all necessary information to manufacture the product. The project “enters” the production phase, which can be considered as constituted by the realization of the parts and the successive phase of assembly. The product, after the distribution, now in contact with the user, and having become a product in use, begins to fulfil the function for which it was designed.

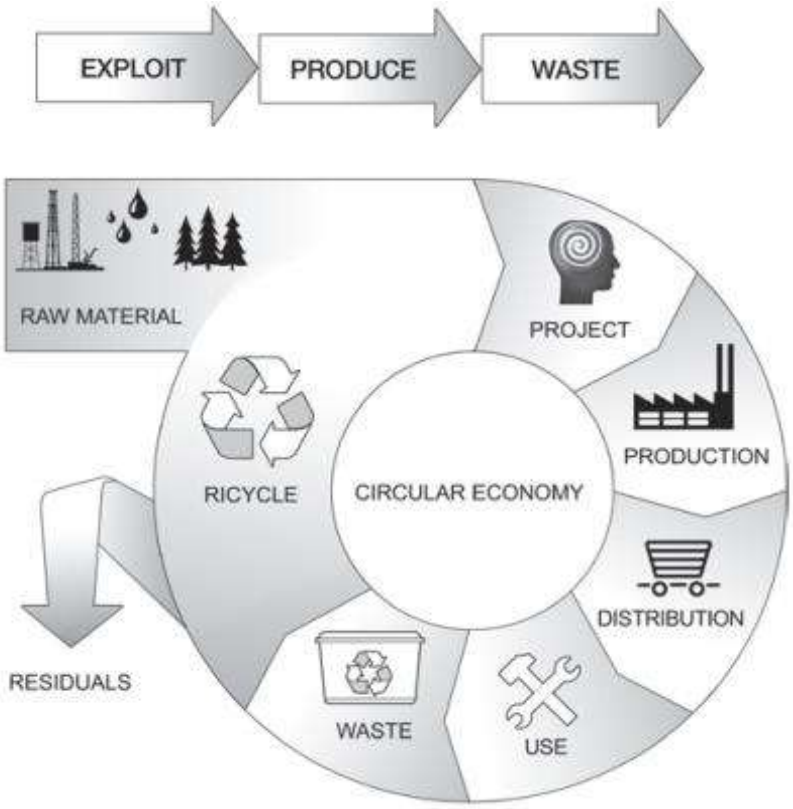

Fig. 9.1 The lifecycle phases of the product in the linear and, respectively, circular economy

The use phase, however long or short, still has a time limit and the decommissioned product can follow two paths: be eliminated and become waste, or be, to various degrees, recycled and go back to the lifecycle as a resource. In this way, the residual can be strong reduced. The lifecycle stages are listed below:

1. Project
2. Production
3. Distribution
4. Use
5. Waste
6. Recycle.

During all of these phases, important and complex environmental aspects must be considered, which can be concisely traced to the following: (a) Collection of energy and raw materials from the environment (b) Disposal of waste into the environment. Until a few decades ago, environmental issues were scarcely considered. Today, however, both insiders and wider public have started focusing on these. Notwithstanding that going backwards in time is impossible and that a return to a pastoral society is pure fantasy, technology also offers tools and methods for sustainable development. One of such tools is “Design for X”, an area of “Design Science” that studies all criteria to face the “X” need. Based on the meaning attributed to “X”, we may have “Design for Production”, “Design for Assembly”, “Design for Utilization” and so on. A particular type of “Design for X”, “Design for Sustainability”, aims to study the criteria and the measures, both Soft and Hard, which can minimize the above mentioned two problems (a) and (b). In particular, in terms of item b), a particularly important aspect is the disposal of end-of life

products, which can, principally for some categories of products, involve especially delicate issues.

Further considerations on the bond between technological advancement with environmental topics can be deduced from the diagram in Fig. 9.2. The depicted hyperbole divides two fields, with the field of sustainability located above the curve, and the field of non-sustainability below the curve.

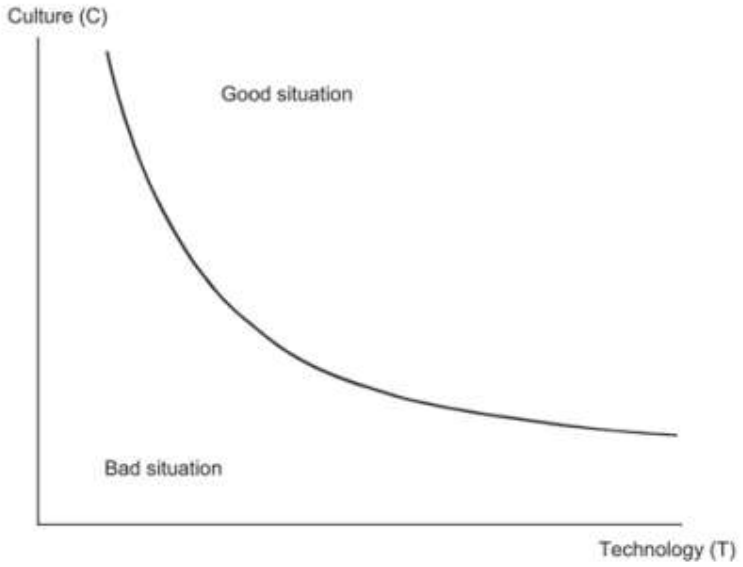

Fig. 9.2 The sustainability hyperbole

The meaning of the curve is clear: to have environmentally sustainable situations, it is necessary that at least one of the two variables should have a high value, but it would be best if that were the case for both variables. The two variables that constitute the "recipe" for sustainability are technological development and culture, intended as incorporation of knowledge and sense of morality.

It is clear even from some prior considerations that technological development is also essential to sustainability. It is also important to note that a harmonious development of technology and of culture can contribute to overcoming, on the one hand, the fear that technological development may "steal" jobs, and on the other an uncritical faith in technological development ("Why think? All you need to do is press a button and it does everything for you!"; we have heard this concerning computers). Concluding, we can say that what is required from technicians is:

- Expertise
- Great attention to all life phases of technical products
- Awareness of the ethical dignity of technological work and a consistent behavior
- Humility, coming from the awareness that one must constantly study to be up to date
- Opposition, as much as possible, to the use of technology solely for material benefit.

And what is required from users of technological products is:

- Scientific-technical background knowledge
- Knowledge of technical products
- A sense of responsibility
- Awareness of one's limitations (self-criticism).

Multiple choice questions

1. Which statement is true
    a) Scientific research is, in itself, neither good nor bad.
    b) Ethics is not needed the way on any research is carried out
    c) Technological development increases the power of man
    d) None
2. Which one is not positive aspects of technological progress on mankind
    a) Technology is an encounter with the laws of nature
    b) Technological development allows to create machines that can relieve humans of some of their work.
    c) The great progress of modern medicine would not have been possible without the development of technology
    d) Technology can now provide aid to disabled people
    e) Technology is not harmful to man kind
3. If it is not well managed and, especially, not filtered by an appropriate ethical spirit, technological development can also generate negative issues
    a) True b) False
4. Which one is the correct order of the lifecycle stages:
    a) Project , Production, Distribution, use, waste, recycle
    b) project, production , Distribution, use, recycle, waste
    c) project, production, distribution, recycle, use, waste
    d) It can be in any order
5. which one of the following is not required from the users of technological products
    a) Scientific-technical background knowledge
    b) Knowledge of technical products
    c) A sense of responsibility
    d) Awareness of one's limitations (self-criticism).
    e) None
6. which one of the following is critically is required from technicians
    a) Expertise
    b) Great attention to all life phases of technical products
    c) Awareness of the ethical dignity of technological work and a consistent behavior
    d) Humility,
    e) All of the above
7. It is fake to say harmonious development of technology and of culture can contribute to overcoming, on the one hand, the fear that technological development
    a) True b) False

Review questions

1) Discuss positive aspects of technological progress on mankind
2) Discuss the negative aspects of technological progress on mankind
3) Discuss the lifecycle phase of the product and circular economy
4) Explain the life cycle stages of the product
5) Why do we need to consider environmental issues while we develop products

6) Discuss what is required from technicians and users of technology

Answer

1. B 2. E 3. A 4. A 5. E 6. E 7. B

Chapter Ten

10. Talent development

10.1 General principles

Talent can be defined as a mainly innate quality, attributed to a natural inclination towards dealing with problems and situations. Talent is often aimed towards a specific discipline. In this sense, we can refer to talent for mathematics, talent for music, talent for business. We are born with the necessary traits to turn lack of preparation into effective skills, so it is possible to refer to talent as innate, and often this is the case. This does not mean that talent cannot be taught, at least up to a certain point. This is precisely the scope of the chapter. Talent can indeed be considered, from some perspectives, as a sort of "integration" of various Soft Skills and, as such, it can be developed and taught to a certain extent. Any constructive action, any life experience, any practiced activity (so long as these activities are critically analyzed and interiorized) are steps that bring us closer to our talent development. The equivocation of talent as inborn: why do we believe this? Because people who often stand out and are successful start devoting themselves to their passions as children, often pushed by parents and/or teachers who support or indulge them.

This spark is often wrongly mistaken for an innate inclination. However, it is actually possible to learn new abilities after growing up. Consider how Leonardo da Vinci was an apprentice to Andrea del Verrocchio: how can we be sure that this time spent carefully and critically observing the gestures and the words of the Maestro did not influence the development of Leonardo's already noteworthy innate talent? Moreover, innate talent equivocation comes from the idea that a talent is not expressed the same way in each person. The difference between someone who remains a good executor and someone who becomes a "genius" is not genetic or, at least, it is not always so. What decisively affects and contributes to forming talented people is studying, hard work, practice, abnegation, application and discipline. Talent is not unleashed on its own; it actually needs to be cultivated constantly, day by day.

The development of talent can take advantage of certain strategies, which are very useful to fully exploit our innate and unexpressed abilities. Some of these, which are deemed particularly sound, are listed here:

1. Observe and carefully analyze who we want to become: "Nobody is better than anybody else, if someone has achieved their goal, we can do so too". It is important to be inspired by people we admire, carefully considering their work. Note that one should not be blindly inspired by someone who is respected or admired, "copying" their ideas and Attitudes without any critical perspective.
2. Emulate top performers, imitating their techniques, their style and the information required to increase the abilities at hand. Pablo Picasso once said: "Good artists borrow great artists 'steal'". It is very important to carefully, critically and ethically select the top performer chosen to be emulated: for example, a morally questionable model should obviously not be chosen! Moreover, in this case too, emulation should always be critical and, especially, flexible: we need to be open to change model and/or direction, if necessary.
3. We need a mission statement, and it is vital to constantly consider this: it is very important to look inside ourselves, analyze ourselves, listening to the opinions of reliable and competent people and deciding what we want to do. It is possible to change one's mission but this should not happen too often, wasting time, money and motivation and broadening

the distance from the objective. In this regard, see the chapter on Flexibility: flexibility does not mean being a “weather vane”.

4. Being open to change and to risk, considering mistakes as a source of learning and not as a failure: of course, this means that mistakes should be analyzed critically and, in particular, that we understand the why and the what of the mistake. It is, therefore, very important to pay attention to the mistakes we make, not trying to “hide” them, but analyzing them and facing reality in order to avoid further mistakes in the future.
5. Choose austerity to have a wider motivational boost. Many successful people came from challenging backgrounds: poverty, problematic families and various hardships marked their childhood. It is precisely the initial austerity of their life that, despite not being chosen, acted as a trigger for them to emerge, to become “someone” and, often, a “number one.
6. Assess the type of technical skills required and acquire them. To achieve a good result is to have the necessary skills to achieve said result. Many of the people, despite their difficult beginnings, worked hard though the problems, studied, perhaps at night, and achieved a qualification that allowed them to approach life with an edge. Skills, after being acquired and worked on critically, must also be applied. Hence the importance of practicing alone to develop and improve discipline. Talent is inextricably tied to practice. Without constant practice, we run the risk of being frustrated, and talent usually remains an unfulfilled promise. Talent is a seed that needs daily watering.
7. Be capable of dividing objectives into stages. Each goal, especially if it is particularly challenging, should be “sectioned” into sub-objectives that are individually easier to achieve. This will also provide the non-negligible advantage of avoiding frustration without impairing self-confidenceand self-esteem.
8. It might be necessary to fight. The “so-called easy” goals have a relative value. To achieve an important goal, it is important to do our utmost.
9. A very frequent error is to seek the easiest solutions. It is an attempt to avoid leaving the personal “comfort zone”. One of the authors, at a young age, asked a teacher what should be done to achieve success. He expected an answer like, “Do what I am doing”. Instead, the teacher answered: “Try to do the most difficult things, those which are generally avoided”. The advice is logical, if we consider it carefully. Indeed, by choosing this path, there will be less “competition” (few people want to take on “difficult” jobs) and, additionally, if we do not become very successful, we shall less likely be criticized for it. Finally, the most challenging activities are an opportunity for growth, both in terms of character and of learning a method.
10. It is essential to think with images. Transform the figured concepts in our mind. It would be even better if the images were dynamic, creating a mental movie to stimulate our

Unconscious mind. This might help to both visualize objectives and to define the most appropriate path to achieve them.

Exchanging bad, old habits with new and positive ones. It is a strategy of great importance. We all tend to do what we have always done: laziness, fear of failure when doing something new, and a tendency to avoid leaving our “comfort zone” are all justifications that are often used as an excuse for not changing. This means “becoming hostage” to old habits. This is one of the main obstacles to talent development. We need to keep in mind that leaving the “comfort zone” often means stepping into the “growth zone”.

To learn something well, we must be capable of teaching it well. This is a great truth, and the gurus of communication say that we remember: (a) 10% of what we read (b) 20% of what we

hear (c) 30% of what we see (d) 70% of what we see and hear (e) 80% of what we personally experience (f) 95% of what we teach other people.

It is interesting to observe how the quantity of what we remember drastically increases when there is an active involvement of the subject (personal experience and teaching others).
Teaching others (and the authors can confirm this through their personal experience) is a great way to formalize one's own knowledge and thus ideas that one thought were clear but which need some fine tuning, concepts that need developing, mental connections that need to be reinforced can emerge. It must also be said that teaching others is a great form of input for our communication skills, and communication is one of the main Soft Skills. If you are stuck, make a change. When facing a challenge (and who has none to face?) we can, in some cases, be stuck and throw in the towel, saying (or thinking) "I will never be able to do this!" Nothing could be further from the truth. When faced with such a situation, we need to analyze the problem, asking some specific questions: "What is exactly the difficulty?", "Where does it come from?", "What are the surrounding circumstances?", "What can I do to overcome this difficulty?", "What can I do to avoid the difficulty?"It must, however, be said that such an attitude initially requires a critical analysis of the difficulty. Some issues, objectively speaking, cannot be overcome.

Being brave brings together passion, perseverance and self-discipline, allowing us to express additional performance. Courage is crucial, as it is essential to overcome challenges. And once again, as always, we need balance, which was discussed in Chap. 7 "Awareness". If courage is a virtue, illogical and irrational courage, which drives us towards useless and serious risks, becomes "madness". Last but not least, or rather, first, we find Intellectual Fusion. It is crucial in order to reach a variation in behavior. Besides the development of the IQ (Intellectual Quotient), a high EQ (Emotional Quotient) is also important. We shall thus have an individual who can be a "Difference Maker" (DM), a complete individual who can face hard problems with IQ but who can also see problems from a different perspective, through EQ. The combination of the two factors completes Intellectual Fusion (IF): IQ + EQ = IF = DM. This will make a professional capable of facing problems in a different way, capable, in other words, of "making a difference". The development of talent has one great enemy: inability. This can have many different facets, some of which are listed below. One facet relates to the solution, which can refer to a problem or situation of any type or level. It can have various aspects:

(a) The inability to find the solution, or in other words, not being able to understand what must be done. It has happened to all of us, and it happens often, that we do not know what to do when faced with a problem or a specific situation. We do not know what is better or worse, what the pros and the cons of the various alternatives are. And here a Soft Skill can come to our aid, specifically Imagination and Creativity. It is precisely imagination and creativity that make us think of the various solutions to a problem and the relative pros and cons to each of these, almost as if they were spawned from our mind thanks to imagination.
(b) Inability to apply the solution or, in other words, knowing what to do, finding the solution but not knowing how to apply it because "it has never been done this way". We inevitably become hostage to habit, to what has been done, incapable of leaving the "comfort zone" and of facing new uncertainties. And here again a Soft Skill comes to our aid, namely Flexibility. By properly applying this Soft Skill, we overcome on the one hand the fear of novelty, of what we have never tried to do, and on the other hand the frenzy to change at all cost, without properly assessing what we might go against. In

other words, a certain amount of healthy fear that keeps us away from danger, but not an untamed psychosis.

(c) Inability to sustain the solutions: once the solution has been found and immediately applied, we feel incapable of persevering on the chosen path. Laziness, tiredness and inconstancy are enemies that stop us from going on. How often do we see young people enthusiastically choose a degree course and then, after a while, drop out because they believe that "the other one is easier" or "with the other degree I can earn more". Thus they change degree course or drop out completely, wasting time, motivation and financial resources, and increasing their level of frustration. Here again Flexibility, a Soft Skill, together with Awareness, can be helpful: ability to change and flexibility are great, but once a decision has been made, one must follow it to the end, without being thwarted by the inevitable challenges.

(d) The inability to sustain the side effects of the solution. Everys olution, to any problem, does not only have highlights but also grey areas. Every perspective, no matter how viable, carries side effects. Here we must give a "weight" to the positive and negative effects of each identified solution and, thus, define a balance statement that can direct towards a motivated and rational choice.

A second facet involves the reaction we can have towards anew situation or a sudden problem. The reaction can have various aspects:

(a) The inability to react, when the constant fear of making a mistake stops any behavior and any action, and the subject remains inert. It has already been mentioned when discuss-

ing more than one Soft Skill, how fear, healthy and rational fear, is a positive attitude. This, in fact, helps us perceive and assess risk and, if necessary, helps us avoid it. This type of fear, therefore, belongs to the conservation instinct. Another matter is psychosis which, often kindled by certain mass media, exaggerates risks, sometimes non-existent or if existent it makes them appear greater and more formidable than what they truly are.

(a) The inability not to react, when the subject loses control and engages in behaviors such as rage, unusual and often violent reactions. This aspect is the reverse of the previous one but, in a certain sense, it is "symmetrical". While the previous was a lack of reaction, this is an excessive reaction. In this regard, see the chapter "Awareness". Loss of control is always very negative, as it can lead to doing things we might regret, which can carry serious consequences. We can also observe that often the fault, at least the moral fault, largely falls on those who behave in a way that provokes these reactions. These individuals would do well to consider some SoftSkills, such as Courtesy, Ethics and Integrity, Positivity and Responsibility. We can observe how, often, they behave in ways that lead to unusual reactions on purpose, to paint the people who are the object of these behaviors in a bad light or even place the blame on them. We could react much better by ignoring such personalities and laughing about their behavior. A famous journalist used to say: "Those who speak ill of me would speak much worse if they knew what I think of them!"

(b) The inability to perceive things correctly, behaving like an ostrich that hides its head in the sand, is another of these facets. This attitude is often due to the lack of observation and the inability to attribute the right importance to things and events as they occur. Often this means being excessively euphoric when facing an event that is initially considered positive but which then turns out to be negative, and to become depressed when

considering an event as negative when it is actually positive. Indeed, it is very important to be balanced in judgement and, especially, to shy away from hasty impressions. How often does an event seem positive only to then turn into a problem, while at other times an event might seem negative but actually reveal itself to be an advantage? Here again is the importance of balance and consideration discussed in the Chapter "Awareness".

10.2 **The development of talent**

Talent is like a sleeping giant that must be awakened. It is always possible to draw water from the well of inventive flair, initiative, and courage. We can fulfil ourselves by completing our own and other people's potential, within our own field. When we create something real, something beautiful and good, no matter how small, we ourselves grow and help the world grow too. If, however, we let ourselves be pray to destructive forces, we tend to deprive things and people of life: we un-grow and make the world un-grow. The following are some significant considerations on talent development. True talent belongs to those who, beyond awareness, imagination, ethics and action, can "sell trust". They must also be able to motivate, inspire, create and improvise: know how to turn problems into opportunities. Talented people, on top of focusing on effectiveness, are also focused on being efficient. They need to be able to make the most of their time, weeding their calendar of non-essential appointments, refusing low priority decisions and requests, knowing how to hold optimized meetings and saving that time for considerations and higher level thoughts. They can best exploit their inclinations and their strengths in order to create and strengthen their key relationships. They also need to be agile when seeking new relationships, and in terms of professional relationships, they need to avoid continually clashing with the same people who are not aligned with today's organizational dynamics that, instead, require aligned adaptation to the rapidly changing needs. Today it is very important to go beyond borders, or to create the best networks with people who belong to a wide variety of functions, geographical locations and Business Units. Thus there is the advantage of achieving a greater focus on networking and of not being intimidated by any setbacks.

Moreover, it is important to broaden our horizons to access new information, to stimulate innovation, imagination and relationalabilities. Furthermore, talented people must possess balanced energy, showing competence and value, rational intelligence and emotional intelligence. On top of proving that they can act to create trust, they use empathic listening skills to foster critical thinking n others. Talent must beware of the complacency trap: arrogance about one's own energy can play tricks. We need to be brave enough to view success in less heroic terms and to critically consider the decisions made in the past. This can be a challenging exercise, as one must have the strength and the courage to reinvent oneself in order not to fall into the trap of "habit", but it is nevertheless very important. For example, when one of the authors was in charge of International Marketing for a large company, he repeatedly heard the owner at the time say: I don't care if you make a mistake, so long as it is something new you tried out, and you are willing to critically accept it. This is because they were led to think that they would have continued to achieve great results, as had happened thus far, while that statement meant that they would have to continue looking for new operative solutions. Beware of those talents who think: "if it is not broken, don't fix it", and do not sufficiently consider strategy. We must not foster uncertainty on what to change and, consequently, make the process last too long, running the risk of being late. Talents that survive the complaisance trap are generally capable of positively carrying out a valuable creation phase.

They are able to reinvent themselves and their abilities in managing potential crises. It is, therefore, important for a talent to be proactive instead of reactive, and thus to think of leaving behind a heritage. It is very important for the genuine talent to leave a good impression behind. It is also true that talent must lead a professional to check the possibility of identifying who can be a successor. Hope, trust and collaboration are values on which talent must lean in order to face an organizational environment where, unfortunately, to this day, it is still hard to promote and support relational aspects (such as Soft Skills), which are the foundations of collaboration.
Synergy becomes a foundational item for success, as it does not mean bringing together various discomyprding opinions in agreement, but expressing the single perspectives and choosing the "best", considering the single points of view. This is an important ability of talent: finding synergy. While the compromise can be expressed as:1 + 1 = ½ synergy is1 + 1 = 3, or 5, or 7.

To this end, it is necessary for talent to be employed in a guided psychological approach, for example respecting the contributions of colleagues, the willingness to experiment with other people's ideas, to care for the way our actions can impact colleagues' work and the final result.
These behaviors are still, unfortunately, rare, due to the fact that a mentality based on lack of trust in other people and on a veritable obsession with status is still pervasive. Talent challenges the tendency to focus on self to, instead, assess what can be learnt from other people. To overcome psychological barriers, which stop us from working well together, it is necessary to beopen to listening and to explore other people's ideas in order to express our own, critically if necessary, and ultimately choosing which to pursue. Knowing how to listen is the first basic rule of communication (even more so if it is empathic). We often cannot listen because we are anxious about our own performance, as we are convinced that our ideas are better than other people's. Hence, we find ourselves navigating conflicts that might have been avoided, wasting important opportunities for a lack of dialogue, making the people who are not directly involved feel left out: the overall result is the decline of the team's effectiveness.

When, on the other hand, our "ego" diminishes, we give each person the opportunity to understand the situation and to, thus, express their opinion, focusing on the objective. How can we improve our listening skills? It is important to ask open questions. This increases the counterpart's "curiosity" and helps him express his own ideas. It is, therefore, a matter of developing "active listening", which means stifling the urgency to interrupt or dominate a conversation, and to centre it around ourselves or to find solutions to other people's problems by mainly focusing on the implications of our own words. In effective collaborations, judgement leaves room for curiosity and people can reach an understanding of how other people's perspectives can be just as important as our own. The difference between active and non-active listening is given by the ability to focus on who is listening and not on ourselves. But listening well is not enough, we must also understand the tone of voice, the body language, the emotions, the point of view and the energy the speaker puts into the conversation. Another important area is how one feels in silence. This is the important role of non-verbal communication.

For many people who love listening to themselves speak, the real problem is that, instead of communicating respect and attention, they end up dominating the conversation, rarely letting the interlocutor speak and often not listening at all, as they are focusing on the fact that "the message is me". It is, therefore, essential to learn to be empathic, in other words, to be receptive towards the point of view of other people, even when we do not agree. It is not easy, but it can provide great results, as honestly understanding the difference between varying perspectives can lead to achieving the "best" solution. Showing empathy makes other people more open to listening: thus

collaboration can move forward in a more fluid way, making it easier to achieve mutual sharing of opinions.

It is also very important to feel comfortable in silence. This does not mean only not talking, but knowing how to communicate care and respect while you are silent, which is quite hard for people who love to listen to themselves speak. Useful exercises to simply listen without giving negative non-verbal signals. We must remember that it is important to use positive body language when interacting with other people. It is not easy to be receptive of the opinion of someone we do not agree with, but the result can be extraordinary, if we sincerely adopt the desire to understand the differences between the two points of view. Judgment must give way to curiosity, to allow us to understand that other people's perspectives are just as valuable as our own.

A useful exercise to this end is called "expanding other people's thoughts" or "leading from inside out", which involves asking questions not to tip the scales in our favour, but to help the other person, observing the evolution of the conversation, without forming opinions. This could actually be a decisive step towards synergy, where any creative solution makes everyone feel they can be truly listened to. Feedback is very important, as it constitutes an important way of enriching ideas. This requires three principles:

1. Listening to all ideas put forward by the interlocutor
2. Being constructive (yes, instead of yes but...)
3. Make the interlocutor look good, make them feel important and place them in the condition to persevere in their activities. Talent often uses the win-win interaction, which is characterized by the fact that all parts satisfy their interest and no part is harmed.

Talent, based on the application of various Soft Skills that have been mentioned here, is a good tool to create leaders that can make teamwork creative and productive, thus determining a style of life.

10.3 **Daily life**

Talent is important in all areas of daily life. It is especially important to integrate talent with the various Soft Skills discussed here. Some examples are listed below: Quick intuition is needed in any situation, of course without making hasty assessments. The ancient saying "Slowly make haste perfectly" expresses the Latin philosophy, which tells us to make haste-not to waste time-but slowly, always thinking and considering each step. It is essential, as repeatedly mentioned, not to be a "hostage to habit", so we should not say "we have always done things this way", "I've never done this before". This attitude leads to the perpetuation of past mistakes and hinders any "new" decision. Another important skill is the ability, when facing a problem (even any of the small issues encountered in everyday life), to examine various possible solutions and make a rational choice. It is, therefore, important to leave old habits behind, to identify solutions that have never been tried before. What skills can help in developing and bringing out talent in everyday life?

1. Courage: the fear of making a mistake, of other people's opinions, is a very negative break in decision-making, even in everyday life.
2. The ability to abandon "comfortable situations", in other words, what has been the status quo so far, and, therefore, theease of facing uncomfortable situations even if they are more rational.

3. Imagination, or the ability to hypothesize possible developments to an existing situation: new ideas can emerge from this and, consequently, their pros and cons.

Memory or, in other words, remembering past situations that can be traced back to the situation at hand, and the ability tore call decisions made and errors committed: this is the best way to avoid repeating the same mistakes.

10.4 **Engineering**

Talent is essential for an engineer, and we can say that it starts with the choice of the faculty. In this phase talent is attributed to verifying one's own abilities and their consistency with personal interests. An aspiring engineer must, of course, be interested in technology and have a leaning towards hard science but also, and here Soft Skills appear, the desire to do something useful for the community and, in particular, the ability to interact with other people. After a reasoned choice, talent throughout the course of studies manifests itself and can be developed by critically examining the various study topics, considering them an opportunity for growth rather than "annoying" impositions, and discovering new cultural interests. From this examination, and by developing histalent as much as possible, an engineering student will be able to choose a field that will be more in line with personal preferences. An important aspect of talent is, however, to objectively and critically face personal aspirations, on the one hand by using the skills possessed, and on the other by exploiting opportunities offered by the "market".

Moreover, engineers can apply their talents and develop them throughout the course of their career. First, the professional task of an engineer can be identified, in sum, as taking care of designing, producing, distributing, utilizing and eliminating technical products. They need both hard and soft skills to carryout these tasks. Hard skills, often with excellent standards, are supplied by university studies. In terms of soft skills, the ones discussed in the previous chapters can be very helpful. Some of them are listed below: (a) Communication: an engineer must communicate effectively, for example through service orders, guidelines to be under-stood and passed on, technical reports on surveys carried out on plants or construction sites. (b) Courtesy: fair treatment of colleagues and subordinates is not a secondary element for an effective work environment. (c) Flexibility: an engineer must be ready to embrace changes.
(d) Ethics and integrity: the importance of deontology for an engineer requires no further comment. (e) Interpersonal relationship: an engineer almost never work son his own; therefore, the ability to interact with others is very important. (f) Positivity: it is important for an engineer to transmit positivity to the people he works with. (g) Professionalism: it goes without saying that professionalismis important for an engineer. (h) Responsibility: it is important for an engineer to always beready to take responsibility and make sure that the people working with him are ready to take their own. (i) Teamwork: an engineer often works with other professionals, so the ability to work in teams is crucial. (j) Imagination and creativity: for an engineer, creative skills are an important driving force for innovation. (k) Human aspects of technology: an engineer is a human being who works for and with other human beings; therefore, he/sh must always keep in mind that technology must be for and not against mankind.

10.5 Teaching and learning

It goes without saying that talent is of the utmost importance for learners. Here again we notice how a teacher's skills must be both hard and soft. Hard skills, which are beyond dispute, entail expertise in the field of competence and continuing education in order to transfer knowledge that is useful and never obsolete.

In terms of Soft Skills, the ones discussed in the previous chapters can be applied to the teaching profession. Courtesy, for example, implies fair treatment of students. Flexibility requires teachers to perceive, even from small signs(non-verbal language is important), the degree of attention paid by students to the transfer of knowledge, and to accordingly make adjustments to the method in real time. Ethics and integrity are essential, especially if we consider that a teacher should, first and foremost, shape people and also be an example. Interpersonal relationships, positivity, professionalism and responsibility are so important for a teacher that they require no further comment. A teacher must, especially when it comes to engineering, often organize and guide group activities, as many of the application activities require collaboration between many students. The ability to manage teamwork is, therefore, a very important Soft Skill.

Imagination, creativity and balance are essential for a teacher. Moreover, especially because they have to form people above professionals, teachers need to keep in mind the human aspects of technology. But the basic tasks of a teacher include two aspects that straddle hard and soft skills: (a) Foster passion for what is being taught: passion, authentic passion, is perhaps the main aspect, as it allows overcoming any obstacle. (b) Provide a problem-solving method. A teacher who gives students these two elements has already done a great job! As conclusion, it is interesting to consider the following figures. Figure 10.1 represents the links between individual, environment and its race in the socio-cultural contest, for the "Talent Difference Maker". Figure 10.2 represents the talent assessment and what is necessary to reach the "five plus top". To this aim, it is necessary to combine potential vs performances, i.e. how the individual utilize the potential (skills) to achieve performances.

Fig. 10.1 Links between individual, environment and socio-cultural contest to reach the "Talent Difference Maker"

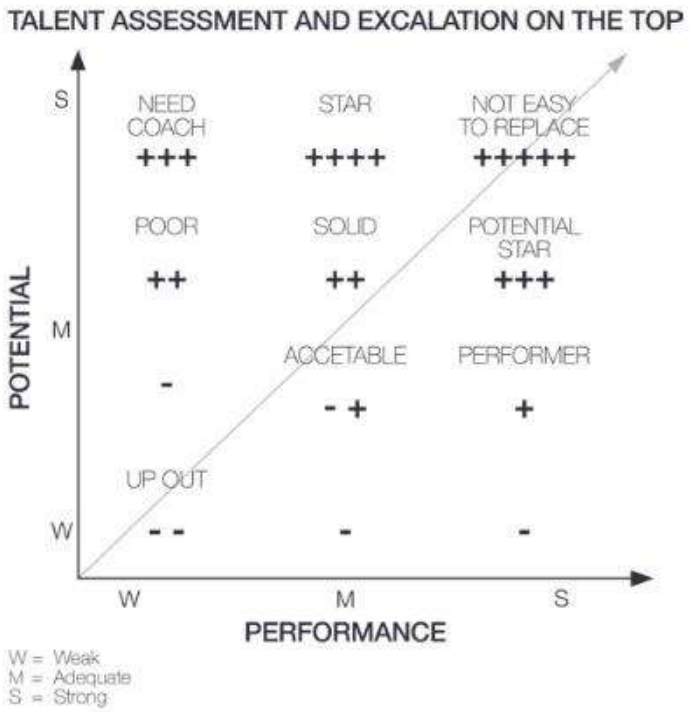

Fig. 10.2 How the individual utilize the potential (skills) to achieve performances

Multiple choice

1. In the talent management end to end process, the workforce compensation management leads to
   a) succession planning b) performance management c) learning management systems d) e-recruiting
2. Professional competence and consistency is exhibited by

a) effective mentors b) performance manager c) appraisal manager d) professional training

3. Talent is often aimed towards a specific discipline
   a) True b)False
4. Which one is not correct talent development strategy
   a) We need a mission statement, and it is vital to constantly consider this:
   b) it is very important to look inside ourselves, analyze ourselves, listening to the opinions of reliable and competent people and deciding what we want to do.
   c) It is possible to change one's mission but this should not happen too often, wasting time, money and motivation and broadening the distance from the objective
   d) Too much flexibility is needed during talent development

5. Teacher's skills must be more of soft skill than hard skill to develop talent to students
   a) True b) False
6. Which statement is correct
   a) Talent is essential for an engineer,
   b) Talent starts with the choice of the faculty
   c) Talent is attributed to verifying one's own abilities and their consistency with personalInterests

d) An aspiring engineer must, of course, be interested in technology
e) All are correct

7. An engineering teacher must have the ability to manage teamwork as engineering involve group activities and many applications require collaborations
   A) True b) False
8. The process of attracting, selecting, training and promoting employees through a particular firm is called
   a) phased retirement
   b) preretirement counseling
   c) talent management
   d) modifying selection procedure

9. Talent management is a process involves
   a) attracting and retaining high-quality employees
   b) developing their skills,
   c) continuously motivating them to improve their performance.
   d) All of the above
10. You need to have a talent management strategy in place designed just for your company
   a) Attract Employees
   b) To gain optimal results
   c) Gain Competitive advantage
   d) Increase Morale

Review questions

1) Define talent
2) Can we learn talent or is it only natural? Discuss using examples if necessary
3) Discuss some of the strategies that would help us to exploit our innate abilities
4) What dis the gurus of communication say about learning something/
5) Discuss EQ and its importance
6) Discuss the most important soft skills you feel very important for engineers

Answers

1. B 2. A 3. B 4. D 5. B 6. E 7. A 8. C 9. D 10. B

References

A. Brann, Neuroscience Foil Coaches (Kogan Page, 2017).

A. Can Ozcan, Ethics in industrial product design (Good, GOODS and Gods), in International Design Conference DESIGN 2002, Dubrovnik,14–17 May 2002

A.Lowen, Il linguaggio del corpo (Feltrinelli, 2013).

A. Pappagallo, C. Porcari, E. Rovida, Un'esperienza sulla prova dellequattro domande. Rotary 2040 3(marzo 2011).

A.Schopenauer, L'arte di ottenere ragione (Adelphi, 1991).

B. Allenby, Engineering and ethics for an Antropological planet, in Workshop on Engineering Technologies and Ethical Issues National Academy of Engineering, Washington (2003).

B.F. Skinner, The science of learning and the art of teaching (Cambridge Mass, USA, 1954).

B. Horowitz, What You do is who You are (William Collins, 2019)

B. Horowitz, The Hard Thing About Hard Things (Harper Business,2014)

B. Pascal, Pensieri e altri scritti (Oscar Classici, 2018).

B.S. Bloom, .Taxonomy of educational objectives (Handbook I.D.McKay,New York, 1956).

C. Ruggiero, M. Luccio, Studiare la comunicazione (Maggioli, 2013)

C.E. Harris, M.S. Pritchard, M.J. Rabins, Engineering Ethics (Wadsworthy, 2009).

C.M. Martini, Conferenza al Collegio degli Ingegneri di Milano, 28April 1984

C. Pardini, F. Martelli, Riconoscere il carattere attraverso l'intuito (Tecniche Nuove, 2014)
D. Alighieri, La Divina Commedia. Inferno XI (97–105)

D. Chieffi, Comunicare digitale (Centro di documentazione giornalistica,2018

D. Goleman, Primal leadership. Learning to Lead with Emotional Intelligence (Harvard Business Review Press, 2004).
D. Marcum, S. Smith, Egonomics (Sperling & Kupfer, 2008)

D. Pitteri, S. Picucci, R.M. Villani, Cause Related Marketing (2002)

E. Berne, A che gioco giochiamo (Bompiani, 1964).

E. da Rotterdam, Moriae Encomium (original edition in Latin), p. 1511

M.M. Robles, Executive perceptions of the top 10 soft skills needed in today's workplace. Bus. Commun. Q. 75(4), 453–46

E. Manzini, Design per la sostenibilità ambientale (Zanichelli, 2007)

E. Rovida, G. Zafferri, Proposal about the introduction of the soft skills in the teaching of product development, in JCM 2018 (International Joint Conference on Mechanics, Design Engineering and Advanced Manufacturing), Cartagena, Spain 20th–22th June 2018.

E. Rovida, M. Bertoni, M. Carulli, U. Giraudo, Integrating TRIZ and QFD effectively in product development: a case study, in TMCE Symposium, 21–25 Apr 2008, Izmir, Turkey.

F. Martelli, Scopri il tuo talento (Tecniche Nuove, 2015)

F. Rosa, E. Rovida, Development of creativity in the engineering education, 35th International IGIP Symposium with IEEE/ASEE/SEFI 2006–09–18, Tallinn Estonia.

E. Rovida, R. Viganò, A. De Crescenzo, D. Raco, Development of innovative principles to perform given functions, in AEDS Workshop, 3–4 Nov 2005, Pilsen Czech republic.
F. Rosa, E. Rovida, R.Viganò, Proposal about the communication topics in engineering curricula, in 39th IGIP (International Society for Engineering Pedagogy) Symposium (2010)

F. Rosa, E. Rovida, La storia dell'ingegneria e la formazione degli Ingegneri, 1° Convegno Nazionale AISI (Associazione Italiana di Storia dell'Ingegneria) Napoli, 8–9 Mar 2006

G. Bateson, Verso un'ecologia della mente (Adelphi, 1977)
G.F. Biggioggero, E. Rovida, Professional deontology of teachers in technical fields, in 33th International Symposium on IGIP in Cooperation with IEEE/ASEE/SEFI, Fribourg, 27–30 Sept 2004

G.F. Biggioggero, E. Rovida, Il profilo professionale del progettista.Progettare 2(1997)
G.Y. Ybarra, Ethics in engineering education worldwide, in 28th International Symposium on IGIP (1999)
G. Gavini, Manuel de formation aux techniques de l'enseignement programmé (Edition Hommes et Techniques, 1965).

G.F. Biggioggero, S. Calabrò, G. Menzio, E. Rovida, Evoluzionestorica di soluzioni costruttive. Il caso di sospensioni per autovettura(Politecnico di Milano Dipartimento di Meccanica e CNR ProgettoFinalizzato Beni Culturali Milano, 2003).

G.F. Biggioggero, E. Rovida, Metodi per la progettazione industriale (McGraw-Hill, 2003) G. Altshuller, And suddenly the Inventor appeared, in The Theory of Inventive Problem Solving (Technical Innovation Center, Massachusetts,1996)

G. Galli, M. Guarneri, E. Rovida, Experiences of engineering design education at Pavia University, in International Conference on Engineering Design (ICED 05), Melbourne, 15–18 Aug 2005.

G. Abbate, U. Ferrero, Emotional Asset (Finedit Italia, 2003)

G. Goleman, Working with Emotional Intelligence (Bantam Books,1998)

G. Nicastro, Alla ricerca del talento (Way out consultant, 2019)
H. Elrod, The Miracle Morning (Magics, 2020)

https://www.kobo.com/it/it/ebook/the-strategy-pathfinder. Last visit 25 April 2020.

http://jamesclear.com/eisenhower-box. Last visit 27 Aug 2020.
https://www.rotary.org/en. Last visit 10 Jan 2021

https://en.wikipedia.org/wiki/Hippocratic_Oath. Last visit 10 Jan 2021

https://smallbusiness.chron.com/10-characteristics-professionalism-708.html. Last visit 10 Jan 2021
https://it.wikipedia.org/wiki/Euristic. Last visit 1 May 2020

https://www.aitriz.org. Last visit 10 Jan 2021

I. Lebowitz, Die Rolle der Ethik in der Ingenieurausbildung und Ingenieurbeuf (IGIP 1989)

I. van de Poel, L. Royakters, Ethics, Technology and Engineering (Wiley Blackwell, 2011)

J.J. Guilbert, Taxonomy of intellectual processes, Didakta Medica (1971)

J.P. Domschke, Kompetenz als Ethische Forderung im Ingenierberuf, in 34th International Symposium on IGIP, Istambul, 12–15 Sept 2005.
J. Rowan, S. Zinaichi Jr., Ethics for the Professions (Wadsworthy, 2003).

K.K. Humpreys, What every engineer should know about ethics (Department of Electrical and Computer Engineering University of Cincinnati, Cincinnati, Ohio, 1999).

K. Robinson, The Element. How Finding Your Passion Changes Everything (Penguin Group, 2009)

M.A. Bierstadt, Mapping the phenol structures of didactic sequences (School of Education Malmo, 1964)
M. Asimov, Introduction to design (Prentice Hall, 1962)

M.W-Martin, R. Schinziger, Ethics in engineering (McGraw-Hill, 2005).

M. Torchio, La bioetica un ponte per la sopravvivenza. Soc. It. Sci.Nat.65 (1973)

N. Hill, Think and Grow Rich (The Ralston Society, 1937).

N. Hill, W.C. Stone, Through a Positive Mental Attitude (General Press,1959).

N. Negroponte, Being digital (Vintage book, New York, 1996)

N.S. Nandagopal, Tools for teaching engineering ethics, in 33th International Symposium on IGIP in Cooperation with IEEE/ASEE/SEFI, Fribourg, 27–30 Sept 2004

N. Torretta, U. Rossetti, Permanent Education: technical and scientific updating in engineering practice, in Congress SEFI (European Society for Engineering Education) (Aachen, 1976)

P. Watzlawick, Istruzioni per rendersi infelici (Feltrinelli, 2013)

P. Watzlawick, J.H. Weakland, R. Fish, Change (Astrolabio, 1978b)
R. Heller, Communicating clearly (DK Pub, 1998)
R. Sharma, Il Club delle 5 del mattino (TREGO, 2019)
S. Bentivegna, G. Boccia Artieri, La teoria della comunicazione dimassa e la sfida digitale (Laterza, 2019
S.D. Cova, E. Rovida, An Italian experience: the continuing engineering education program at Politecnico di Milano, in 5th World Conference on Continuing Engineering Education, Helsinki, Finland (1992).

S.G. Bona, G. Genta, G. Mimmi, C.E. Rottenbacher, E. Rovida, Theancestors of the motor car: first steps in terrestrial locomotion, in VIConvegno di Storia dell'Ingegneria-Napoli 2016 2nd InternationalConference on the History of Engineering, Naples, Italy (2016)

S. Johnson, Chi ha spostato il mio formaggio (2017)
S.M. Markle, Good frames and bad. A grammar of frame writing (J.Wiley & Son, 1964)

S.R. Covey, The Speed of Trust (Simon and Schuster, 2006)

T. Cram, Customers That Count (Pearson Education, 2001)

T. Harris, Io sono OK, tu sei OK (BUR Saggi, 1974)

T. Hora, Encounter with Wishdom (Bookone, 2018)

T. Hora, Self-Trascendence (The PAGL Foundation Inc., 2008)

Watzlawic, P. Beavin, J. Helnik, D.D. Jakson, Pragmatica della comuni-cazione umana (Astrolabio, 1978)
W. Allen, A proposito di niente (La nave di Teseo, 2020)

W. Bennıs, The Habits of Highly Effective People (Simons and Schuster, 1989)

www.ecahe.eu/w/index.php/Dublin_Descriptors. Last visit 4 April 2021

www.etria.net. Last visit 10 Jan 2021

V.A. Lofthouse, D. Lilley, Teaching ethic in design: a review of current practice, in International Conference on Engineering DesignICED2009, Stanford, 24–27 August 2009

V.I. Solntsev, The engineering ethics course design for lifelong engineering education, in 30th International Symposium on IGIP Klagenfurt(2001)

V.I. Solntsev, Engineering ethics contributes to engineering padagogics,in 29th International Symposium on IGIP, Biel (2000).