

TECHNOLOGY AND INFORMATION
TECHNOLOGY THROUGH THE LENSES OF A
COGNITIVE APPROACH AND A
PHENOMENOLOGICAL APPROACH

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The Philosophical Roots of Organization Studies and Organizational
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1. Introduction

Normally the term technology suggests an idea of sophisticated machines that carry out complex tasks automatically, for example. Technology is considered a whole of instruments that produces, makes and works and it supports people in everyday life. Besides, it is unquestionable that the importance of technology is growing every day and is becoming an active part of people's lives. People are surrounded by technology. At home and at work technology is an important beings' partner.

This paper pursues a twofold objective: to investigate the nature of technology and how it enters in the life of each of us. In this proposal a cognitive approach (Marradi, 2007) and a phenomenological approach (Husserl, 1970; Heidegger, 1962) are going to be proposed.

The former outlines a general framework that contains and portrays reality that surrounds us. This reality is reached through knowledge that is constituted by the sphere of references, the sphere of thinking and the sphere of language. The sphere of reference represents all possible objects of thoughts (not only physical objects but also actions and reflections). The sphere of thinking concerns psychological means that human beings have at their disposal to know references. The sphere of language represents the methods used to communicate and record thinking. However, the point is that this approach leads to a static analysis. In other words, it describes a picture of reality outlining the several components that constitute it; on the other hand, reality is subject to a never ending process of creation and transformation due to the continuous interactions of its three spheres. All of this leads to a change of focus and particularly on the modes through which knowledge of reality evolves, is diffused and is taken into consideration by subjects.

The phenomenological approach has been judged apt for investigating this process about knowledge of reality. It is a philosophical approach founded by Husserl (1970) who considers philosophy the science of common sense. This is due to the fact that the purpose of this approach is to analyse what is manifest, what is tangible and perceptible. It is not interesting to examine what there is beyond phenomena and what appears. Rather, it is suggested that the object of knowledge is the look, what reveals itself and what is naturally detectable using the senses. Here, it is not only important to consider matter, nature and human beings, as obvious elements that surround us, but also how subjects interpret them, how they make sense of them and how these elements take part in everyday life. The point is to see what permits us to understand situations, what gives objects or human beings a precise role and a precise meaning and what permits subjects to act in a specific social context, for example.

Heidegger's thinking (1962) suggests a further step analysing knowledge of reality. That is, what pushes subjects to know and understand the environment that surrounds us and what defines the understanding of it, namely for which reason subjects make a specific sense to an environment. Heidegger maintains that the idea of project, of capabilities and opportunities is a fundamental attitude of human beings. Each thought and action of subjects is characterised by this idea that drives them in everyday life. Therefore the knowledge and the understanding of a specific environment is driven by aims to pursue a plan, for example. These aims make sense of things, nature and people and if they differ even their meanings change.

This study on knowledge of reality has the peculiarity to focus on technology and information technology (IT). To put it in a different way, the reality under examination is related to these entities and on modalities through which they contribute to give a shape to reality. Specifically, technology and IT examined according to the cognitive approach, and particularly through the lenses of the sphere of references, the sphere of thinking and the sphere of language, throws light on structural differences between them. On the other hand, the phenomenological approach tries to examine, at first, how technology and IT enter into the lives of all of us, then their role in human beings activities and, finally, how subjects consider, give sense and interpret these technologies as instruments that contribute to support and control every day reality. Conclusion outlines a series of suggestions in the designing of both technology and IT.

2. A cognitive approach to reality

The cognitive approach is based on Marradi's works (1994, 2007) where he maintains that knowledge, in epistemological terms, is constituted by the sphere of references, the sphere of thinking and the sphere of language. Here, the term sphere is used as a synonym of the term domain or realm, for example. The sphere of references is composed by all possible objects of thoughts, meaning not only physical objects but also events, people and their characteristics, actions, but also ourselves when we think about our actions and thoughts. Reality is not only formed by tangible things but also by social relations, reflections and introspection.

Thinking and precisely the sphere of thinking is a means that human beings have at their disposal to know references and it is analysed independently from its expression by language. This sphere might be subdivided into two parts: conscious thoughts that are normally expressed using language and mental operations that are often unconscious and represent automatic cerebral activity but they become conscious in particular contexts. When subjects with a particular habit, practice or experience realise that the habit is not useful anymore, in that moment they discover the nature of these behaviours. Tacit knowledge (Polany, 1958) helps to further investigate mental operations. This knowledge is difficult to analyse, it cannot be represented by mathematical or logical formula, but it affects important aspects both of the individual and social lives of subjects. To play tennis, to ride a bicycle, to go down stairs, to build a structure etc. need complex mechanical, optical and, physical knowledge that are absolutely unconscious, even if just in part, can become conscious. Similar terms can be used concerning behaviours that are requested in specific social contexts. These behaviours correspond to social rules, habits, conventions that are adopted in different situations like to hold in a newspaper stand, among a group of friends, in a workplace etc.

The sphere of language completes the analysis of knowledge using the cognitive approach. Language is not the only system by which subjects communicate and record thinking. In fact, gestures, facial expressions, body movements, drawings and forms have the same functions. This approach analyses only linguistic signs because of their importance. In fact, language might be defined as a system of signs produced and understood by subjects of a certain community that have meanings in a large measure shared by those subjects, a considerable stability in time and rules structures that are known by the subjects' (Marradi, 1994). Nevertheless, this system evolves suggesting a subdivision of language into ordinary language, special language, technical language and formal or artificial language. Ordinary languages are used in eve-

ryday life and represent the structure, the trunk that supports other kinds of language. Special languages are formed by specific social groups in consequence of their stability and frequent social interactions inside them. Technical languages are special languages formed in professional environments and are characterised by descriptive and argumentative functions. Formal or artificial languages derive from conventions that exactly define the meaning of signs. The transition from special to formal language is characterised less and less by the importance of semantics (relations between signs, their meanings and their references) in respect to syntax (rules that drive relations among signs). For example mathematics or computer languages are based on rules that govern relationships among signs that have a specific and single meaning. Moreover, formal language overcomes problems of pragmatics (relations between signs and users who use and interpret them), that is to say, interpretations of signs by subjects. In fact, communication is possible even if people do not speak the same language or come from different cultures so that formal language permits communication between men and computers.

The cognitive approach posits several questions for investigating reality. One of these questions originates from the fact that thinking cannot exactly reproduce or photograph references. A specific event or even an object (references) can be conceived differently by different persons. Concepts that can be used to express them are not necessarily the same. Therefore, there is not a rigid correspondence between references and concepts used to represent them. Leona Tyler (1969) states that there is no object with inherent characteristics that forces its perception in a specific way. On the other hand, to consider entities independent from concepts used to represents them is equally misleading. In this perspective, Weber (1949) agrees with the fact that concepts and judgements are not reality and they neither copy it but they allow its ordering in a valid way.

But impossibilities of reproducing reality exactly through thinking are not the only questions. Another one derives from the fact that references have to be recorded and communicated. The relationship between objects and events, on the one hand, and language, on the other hand, dates back to Ancient Greeks. At that time, it was common the objectivity of language. That is, the idea that there is an authentic correspondence between references and words that designate them. Even during Middle Age, according to the scholastic philosophy, this idea persists even though thinking was considered the origin of words. However, in a second moment, it took place a detachment and words became objects another time. Even in the last century, this stance has seen important supporters as the Vienna Circle and the behaviourist school in psychology but, recently, it has lost steam. Tyler (1969) affirms that non only ref-

ferences have no inherent characteristics in order to perceive them exactly in the same way but also they have no characteristics to be linked to a specific name. The strict correspondence between references and words is not thinkable given the richness and complexity of the former in respect to the latter. A word can indicate several objects or events as time passes by. In fact, it is continuously subject to use in different social contexts. Therefore, the link between references and words cannot be rigid and, rather, elasticity typifies it. However, languages cannot be used arbitrarily as they have their own structures binding expressions. Among the reasons that prevent to establish a strict link between references and words, there is the mediation role played by thinking. Words can be conceived as symbols of concepts elaborated by our minds. They are instruments in order to outline our experiences and all of this contributes to further move away references and words.

The question concerning the relationship between the sphere of thinking and the sphere of language is epitomized by the distinction between concepts and terms. Concepts are copies of references that take place in our mind. As it has been mentioned above, they are devices in order to manage life experiences or events (Weber, 1949). Therefore, they are significantly distinct from terms that can be conceived as components of a language established in a specific social context. Nevertheless, supporters of a rigid link between concepts and terms are numerous even in this case. From Cartesian logicians of Port Royal in the middle of the 17th century to Chomsky (1957), it has been developed the idea that a language is at the origin of concepts. And in some sense, artificial languages work in this way. They establish a rigid link between concepts and terms but at the cost of abstract and relatively plain references to which they refer to. But, normally the thinking is fluid, volatile and solidified because of language. What is unclear, fluctuant, and nebulous in our mind acquires stability turning to language and through it also memorized. Of course, this is not only valid for a singular individual but also for other members of his/her social context. Communications becomes available when concepts have been depersonalized and codified through an inter-subjective code inasmuch as language can be conceived as the public aspect of concepts.

The questions posed by the cognitive approach throw light on the limits of scientific research. The study of reality, necessarily, recurs to concepts and to their expression through a language. It has been showed above the existing gap between references and thinking, the gap between references and language and the gap between thinking and language. Therefore, it is important to be aware that observations and statements achieved by scientific methods suffer about these gaps. Observations and statements are not about reality but about something different. However, not in all cases these gaps are present.

There are disciplines like math, geometry and logics in which references and concepts are strictly linked each other. But here reality is not involved. These disciplines do not imply the five senses as their objects of investigations are human speculations. Moreover, they are also characterized by a rigid link between concepts and words being based on artificial languages valid everywhere and in which each sign has only a specific meaning.

3. Technology and information technology through the lenses of a cognitive approach to reality

The point now is to see if knowledge outlined through the sphere of references, the sphere of thinking and the sphere of language can be used to investigate technology and information technology. Particularly, can these three spheres represent their essence and their intrinsic characteristics? At first, let's define technology. According to the dictionary M. Webster, technology is "the totality of means employed by a people to provide themselves with the objects of material culture". Technology as "the totality of means", suggests an idea of objectivity and matter that characterises the sphere of references. This sphere represents all possible objects of thought both material and immaterial. However, the definition proposed suggests another idea. In fact, technology can be employed "to provide themselves with the objects of material culture". This idea implies that technologies cannot only be analysed as simple objects as they contain the capabilities and power to act on references thereby producing and transforming them.

The sphere of thinking might help us to better understand this point. This sphere has been defined as psychological means that human beings have at their disposal to know reality or references independently from their linguistic expression. Even though it is not possible to consider human beings as technology, it can be regarded as a whole of instruments produced by subjects to know reality or references. Technology can be conceived as tanks of thinking materialised into objects that produce other objects. Human beings delegate and transfer their thinking to technology. In fact humans enable technology to substitute for mankind. These considerations permit us to maintain that technology is both part of the sphere of references and the sphere of thinking as they are humans' instruments to know reality or references.

As it was quoted above, the structural approach argues that thinking cannot reproduce or photograph references exactly. This assertion suggests a deeper analysis of technology. Even though it is used to carry out specific tasks, its use might provoke effects that are not expected at the start. Pollution, green-

house effects and nuclear energy treatments are examples of the consequences of the use of technology. These effects can be considered gaps between the sphere of references and the sphere of thinking.

Heidegger (1977) tries to analyse reasons for this gap. He maintains that modern technology is based on the exploitation of nature. In this proposal Heidegger uses the term provocation to underline that mankind exploits nature to get what is necessary for his needs. In order to explain this concept he shows how a bridge on a river exploits nature differently in respect to a hydroelectric power station. In the latter case nature is deeply used and employed in order to obtain energy that is hidden and not present naturally. But Heidegger suggests another reason for this gap. Humans use technologies as instruments and as a means without paying attention to the consequences provoked by their use. In fact, it is important is to achieve a purpose; to produce or make a particular thing, whereas the side effects of their use might be neglected.

So far the cognitive approach has been used to investigate technology in general, but the purpose of the present work focuses on a particular kind of technology: information technology (IT). IT might be defined as the totality of means employed by a people to provide themselves with the objects of data, voice and image. However, can we consider IT in the same way as we do technology, since the sphere of references and the sphere of thinking represent it? Surely, IT is material object of thought and thus can be defined by the sphere of references, but it is also a tank of thinking and an instrument to know reality or references. Therefore, IT makes up knowledge represented by the sphere of thinking. But, at the same time, it is a calculation instrument, and a mean that produces, records, stores and spreads data, voices and images and the sphere of language just represents how thinking can be spread and recorded.

In addition, the cognitive approach warns us about relationships between the sphere of thinking and the sphere of language. Language cannot reproduce thinking exactly because the latter might be considered as a fluid and continuous process of ideas, intuitions and imaginations, whereas language objectifies and fastens thinking to meanings that are shared. For this reason ordinary language is flexible and the same word can have different meanings in different social contexts. This flexibility does not concern computer languages in which each sign has a specific and single meaning. These gaps between thinking and language and between ordinary language and formal languages (such as computer languages) can generate some limits of application for instruments in artificial intelligence and expert systems because these systems risk

representing the thinking of designers that could not be transferred perfectly to users.

The concept of knowledge proposed by the cognitive approach might suggest an overall vision of technologies and the importance of technologies in the development of knowledge. Additionally, it stresses the difference of IT in respect to other technologies. In fact IT contains all three spheres of the knowledge concept here introduced. This might point to a complexity in designing them because of the gaps between the sphere of reference and the sphere of thinking and the sphere of thinking and the sphere of language, but, on the other hand, IT might be a powerful instrument in the growth and diffusion of knowledge.

4. A phenomenological approach to reality

The cognitive approach defines the means human beings have at their disposal to know physical and social reality. The three spheres are useful to represent the complex concept of knowledge; they single out elements, ingredients and materials to build knowledge but they do not show how these materials interact to form it. Thus it is necessary to analyse processes that produce knowledge.

For this proposal, the attention moves to phenomenology as a philosophical approach considered able to investigate knowledge according to this perspective. Husserl (1970), the founder of phenomenology, maintains that philosophy could be defined as the science of banal and obvious truth that is put into effect analysing processes that form common sense. Phenomenology is not a thinking stream of philosophy but a methodological conception. Its purpose does not concern objects of philosophical research but how to analyse them (Heidegger;1962).

The phenomenological approach is an alternative solution analysing everyday life with respect to the so-called thesis of natural attitude (Husserl; 1970). This thesis represents the common belief that the world exists and it is always in front of us with its objects, things, aspects, etc. It is independent and is not possible to control and dominate it. The world is objective and is true for everybody. On the other hand subjective reality is dependent and true by it; it is formed by each product of subjects' minds and experiences that belong to actors as individuals. The reality of common sense and natural attitude is then characterised by two levels: an subjective level and an objective level.

The thesis of natural attitude maintains a kind of knowledge in which subjective aspects must not be present. Subjectivity is the source of errors and

knowledge represents how objects, things, matter or references are realised in front of us with their characteristics, their nature and their structures. In this proposal, methods, instruments and rules might be used to reach exactly the nature of the object analysed. But new instruments and new technologies might permit the realisation of more knowledge about this object. Even if knowledge is temporary because of effects of these variables, there is the awareness that it is possible to reach reality and to distinguish what is true and false and what is real and imaginary (Piana; 1966).

Even if the knowledge that derives from the thesis of natural attitude is logical and rational, the scepticism does not cast doubt on the validity of singular knowledge, but on the premises and principles that drives this thesis. In fact, the assumption of objective reality is the object of criticism of scepticism. For example, suppose I am in a dark zone and I think I see quite far away a man who is moving his arms, but, when I draw near, I discover that it is not a man but a tree moved by the wind. This example suggests that even the tree might be an illusion, in fact a third image might take the place of the tree, because the first image seemed as real as the second. Scepticism maintains that the objective reality is a dogma because knowledge is based on subjective images that nobody can guarantee will correspond with objective reality. Following this approach there are no possibilities to distinguish objectively what is true, false, imagination, or reality.

Even if scepticism represents an interesting approach about the validity of knowledge, it is absurd because it denies the existence of the world and what is objective, maintaining that knowledge is a chain of images. But everyday life is characterised by actual things; by actual human beings and by actual nature.

Both the thesis of natural attitude and the scepticism do not satisfy the necessity of linking real knowledge of common sense to a theoretical approach that can explain it. The concept of phenomenon might be useful at this stage. In fact it represents what appears; what is tangible and what is perceptible, while it does not depict objects or references themselves.

For example reality of an object depends on the view by which it is analysed. Different views mean different realities. They are appearances that become the core of knowledge analysis. Knowledge of «real» nature of references or of objective knowledge according to the thesis of natural attitude is no more interesting. Now it is knowledge that springs from relations between subjects and references that become the object of analysis.

Even if this knowledge is formed by perceptions, it has a character of certainty. Certainty derives from the fact that the act to perceive is sure even if there is not sureness of the object of perception. In fact, it is not possible to

have doubts of subjective acts in facing the world. What are sure are not the objects that I am seeing, but the fact that I am seeing this object (Piana; 1966). Moreover acts of perception establish what is real and unreal, what is true and what is false. But realities and imagery of perceptions derive from subjective aspects and from personal acts of analysis.

So far the concept of phenomena has driven us to the validity of subjective knowledge but it does not assure that what is valid for a subject is also valid for others. Again we arrive at the problem of objective knowledge. Objective knowledge in this context acquires a different meaning. It does not represent characteristics, structures and the nature of reality, but what is valid for everybody. In this proposal the concept of validity determines objectivity and reality is the result of interrelations among subjects. Objective reality or, using Husserl's words, inter-subjective validity, is a result of a long social process in which many subjective realities interact. The result might be considered an oversimplification and a reduction of «reality» to what is appearance, but it represents the truth of obviousness in how it shows itself.

Not only does phenomenology analyse the formation of obvious and what is common sense and delineates a theoretical approach to define objective reality, but it also examines the origin of individual acts that define phenomena. Husserl (1970) defines phenomena as the result of intentionality. Intentionality represents activities and concerns of subjects toward references. Activities and intentional acts define meanings and nature of objects. For example a glass of water acquires its reality inside a context of many intentional acts. I discover it only if it becomes necessary to my activities and concerns. However, I will never reach the reality of my glass in its complexity but only that aspect regarding my intentions.

Conscience is the concept used by Husserl to define the potentiality of actors and subjects' capabilities to act. It does not represent the idea of a place in our inner being in which to reflect on us or a structure of spiritual or mental acts that govern our behaviours. Conscience is the whole of intentional acts referred to references as perceptions, wishes and manipulation of objects. References are part of this concept because «Consciousness is always the consciousness of something» (Piana; 1966, 90) it is not an object in itself. It is the background of intentional acts by which to activate references. The concept of awareness might be used to single out different levels of conscience. In fact intentional acts might be subdivided into a continuum from completely conscious acts to completely unconscious acts.

So far the phenomenological approach, using the concepts of appearance, validity, intentionality, and conscience, has outlined a picture and a representation of relationships between subjects and phenomena. But Husserl's work

suggests a further object of analysis: the logic that drives interconnections among them. The concept of essence is used in this proposal and it represents the framework of phenomena interconnections and the plot that makes sense in phenomenological data. Essence is not only the result of correspondence between phenomenological data and intentional acts, but also an operation of subjects to put in order and to read them. When subjects make up a process, a genesis builds a defined construction of phenomena, then the phenomenological analysis might throw light on the logic that connects and makes sense to each piece of phenomenological data.

Husserl maintains that the origin of individual acts derives from the concept of intentionality, and conscience defines the background that drives subjective intentions, while Heidegger upholds that the concepts of Being-in-the-world or Dasein, using the German term, and concern represent their origin. These last two concepts are going to be examined because, even if they present the formation of everyday life and common sense in a slightly different way, with respect to Husserl's analysis, they turn out to be more useful in analysing technology.

The concept of Being-in-the-world or existence is used by Heidegger (1962) to analyse being and the roots that drive the life of each of us. These roots are deeply planted in the history of subjects. In fact human beings are always the result of their past, even if often they are not completely aware of it. The past represents the whole of experiences and for this reason is always in front of our existence as an asset to face the future.

Heidegger's work not only points out the importance of history in analysing beings, but also the idea of possibility and project. Human beings are not considered as a whole of properties, the way objects are, but a sum of capabilities and possibilities. Each act carried out by a subject is the result of a plan or a project. This is characteristic of mankind only and is its' essence. The essence of beings is not something factual or stable, but is this idea of future, of possibilities and opportunities that are always in front of them. Each thought derives from this idea that human existence is not based on what is real and present, but on what might be in a vision of the future, the project (Vattimo; 1971).

Visions and projects are not abstract. They are plunged in an environment of things and people. The term "Being-in-the-world" suggests the conception that subjects are not beings who live in a dream world without connections with the surrounding milieu, but they are deeply engaged in all that is within reach.

In this context, objects, for example, are not simple entities provided by specific characters, but they become instruments, means to produce a work.

When I use a hammer I am not careful of it but of my action and of the result that I want to achieve while hammering. In this case projects and actions transform objects from simple entities in the active part of my life and they become part of my being. Even the moon might become an instrument or a means if its light gives me particular feelings or moods (Vattimo; 1971). I take all that is around me to pursue my life vision.

Heidegger (1962) uses the concept of concern to explain how simple entities are transformed into instruments at the disposal of subjects' lives. This concept might be defined as the completion of the concept of Being-in-the-world. In fact, it represents the way by which beings build their existence, the way by which they consider, value and use things and people that surround them.

The time element is important in this discourse. Time is the common denominator that connects the past and the roots of beings with their projects and their future. Considering the time element, the concepts of Being-in-the-world and concern can represent fundamental attitudes of human life. Fundamental attitudes do not only delineate subjects as entities who subjectively observe, establish, verify and describe what is present and within reach, but also subjects who, endowed with experiences, are thrown into the future designing their life according to the surrounding milieu (Volpi; 1994).

Heidegger (1962) emphasizes another aspect that comes out when our actions face some difficulties. Here, actions do not work any more and it is difficult to follow a plan. For example, suppose the hammer I am using suddenly breaks. In this moment my attention is moved away from the plan and by what I want to do, to the hammer. In this moment the hammer is no longer an instrument but it is a simple entity with its characteristics and structure. Moreover it becomes, immediately useless and is also in the way, because now the hammer is an obstacle in my plans.

Heidegger's work now permits us to single out two different kinds of knowledge. The first, connected to the subjects' projects, consents to use resources at disposal in the subjects' environment, while the second, brought about by a breakdown while working on a project, shows the single elements that form the environment.

5. Technology and information technology through the lenses of a phenomenological approach to reality

The cognitive approach has been used to analyse frameworks and elements of technology. Now the phenomenological approach is going to be applied to

examine how technologies enter into the life of each of us and in which context they become part and how we make sense of them.

How do technologies enter into the life of each of us? Using the phenomenological approach and in particular Heidegger's thinking (1962) technologies are not particular objects endowed with particular characteristics, but instruments and means driven by subjects' actions and projects to produce or transform things. Technologies have become an active part of our lives; they support, control and help us everyday. But this affirmation is not completely true because, as it has already been quoted, a breakdown can happen using instruments. In this case they are transformed into objects and into simple entities with their characteristics and structures and a new knowledge is necessary to rechange them into instruments.

Ciborra (1996) suggests three ways to show how technologies and in particular IT enter our lives:

1) Perception. Perception represents technologies from a scientific point of view. They are thought of as the whole of characteristics and structures that are in front of us, but they do not become part of a wider context of meanings. Perception considers technologies to be specific objects not affected by their surrounding environment. They might be considered abstractions because they have no ability to overcome the impact of practical uses.

2) Circumspection. Circumspection represents technologies as objects that have to face obstacles of implementation. A technology is seen as a possibility among others to produce and transform things. As such, it is always subjected to breakdowns. Moreover breakdowns are considered normal events that might be used to ameliorate implementations of technologies.

3) Understanding. Understanding represents technologies as things that become part of a context of meanings. Technologies turn out to be instruments that are taken for granted. They might disappear in use. This is different from the previous cases in which technologies are abstractions of functions or objects that face obstacles of implementation. In this case the hammer vanishes in the action of hammering.

These three ways show how technologies enter our lives. They might be considered a continuum in which on the one hand technologies are independent entities characterised by their own properties and structures whereas on the other hand they disappear in a flow of actions.

The analysis carries on examining only the 'understanding' because it is considered the norm and characterises common uses of technologies. Moreover this way might be the objective at which subjects aim in using technologies. In fact they seem to be invisible and they do not place obstacles in the way.

Technologies have no meanings alone. They always belong to a whole group of elements. They need to operate a whole of installations and energy. Each element needs other elements. A garage might be represented by a whole group of things and each of them function in relation to others. Elements form a chain according to their utility and characteristics. Relationships are established among them. This concept is well shown by Heidegger (1962, 97):» Equipment - in accordance with its equipmentality - always is in terms of its belonging to other equipment: ink-stand, pen, ink, paper, blotting pad, table, lamp, furniture, windows, doors, room. These 'Things' never show themselves proximally as they are for themselves so as to add up a sum of realities and fill up a room. What we encounter as closest to us ... is the room...(as) equipment for residing».

Heidegger's assertion suggests another question: what is the logic that drives relationships among technologies? What is the idea that permits the constitution of a garage, for example? It is the work: the objective of our activity. In the case of the garage the objective is to repair cars. It is this idea that connects technologies to each other. Technologies, following the phenomenological approach, become part of a context formed by a logic that takes into consideration both the whole of procedures that drives their use for a particular purpose and users' tastes, characteristics, habits, etc. of technical production.

So far, we have analysed first the three ways by which technologies enter our lives, then how they are connected to each other and now the objective is to see how subjects make sense of them.

It was already quoted that the essence of human beings, what characterises only mankind, is the idea of future, of capabilities and opportunities that are always in front of them. In fact each act carried out by a subject is the result of a plan or a project. But what brings about projects? What determines and makes them up?

Each project is the result of subjects' histories. Each of us knows a specific social context; its rules, characteristics, values, habits, etc. This social context takes part in forming us. The knowledge of this context gives us a vision of what and who surrounds us. It permits us to interpret, to make sense and to interact with the world because each part of it is interconnected in a logical and legitimate way. It is this understanding of the context, of the environment that permits us to act on it. These kinds of actions have been defined as projects. Projects are not only the result of the understanding of social contexts and of capabilities to act on that understanding, but also the result of instruments at our disposal. Projects are based on potentialities of resources that may be used to pursue them. Namely it is necessary to know what results are attainable to employ means that are within reach.

Technologies represent this aspect of project concept. They are means and capabilities at subject's disposal to pursue projects and they make up the environment in which human beings act. They are instruments used by human beings to follow, plan, and project instructions because they make sense to them. Plans and projects form a framework in which technologies hold a specific rule. Technologies become part of subjects' lives supporting and helping them.

The phenomenological approach and the knowledge of everyday life permit us to analyse technologies in a wide way. At first, they are considered elements of a mosaic in which everyone is connected to each other (technologies as a gear of a bigger mechanism). Secondly, this approach suggests that they are not only things employed in production and transformation, but they are also objects of cognition as suggested by Ciborra's work. Thirdly, they are a ring of a chain of a whole of procedures driven by the purpose of developing a specific task. Finally, technologies are part of subjects' lives as capabilities and opportunities as the basis of the essence of human beings' vision of the future.

6. Conclusion

To conclude, the objective is to find out if the cognitive approach and the phenomenological approach used to analyse technologies can suggest some indications for designing information technology (IT). Here, IT represents not only procedure-oriented applications, namely instruments that support production control, sales, accounting etc., but also co-ordination technologies that support social relationships (Ciborra; 1993). Therefore IT can be considered a link between other technologies and society.

Analysing the gap between the sphere of reference and the sphere of thinking, namely thinking cannot reproduce or photograph references exactly, the cognitive approach suggests that technologies can provoke effects that are not initially expected. In fact human beings use them as instruments and means without paying attention to all the consequences caused by their use. What is important is to achieve a purpose; to produce or make a particular thing, whereas the side effects of their use can be neglected. Even though it is not often possible to forestall them, designers might consider side effects as real possibilities and this awareness might be useful to face these unexpected consequences.

But this approach singles out another gap between the sphere of thinking and the sphere of language. In fact language cannot reproduce thinking ex-

actly, because the latter might be considered as a fluid and continuous process of ideas, intuitions and imaginations, whereas language objectifies and fastens thinking to meanings that are shared by everybody. For this reason ordinary language is flexible, in fact the same word might have different meanings in different social contexts. Therefore the designing of IT, that, unlike other technologies, has to take into account even the sphere of language and then this gap due to the fact that in computer language each sign has a specific and single meaning, leads to rigidities representing meanings typical of social interactions. These rigidities suggest difficulties to implement technologies such as artificial intelligence (AI) and expert systems. In fact, even though they may represent wide aspects of subjects' cognitive processes, AI and expert systems are bound by using a formal language. For this reason probably it can be more effective if information systems, instead of reproducing subjects' cognitive processes as AI and expert systems, support interactions and the development of meanings among subjects.

Not only the cognitive approach but also the phenomenological approach may suggest some hints in designing technologies and IT. Actually, it points out that technologies and IT enter subjects' lives in three different ways: perception, circumspection and understanding. Whereas in the understanding way they are invisible, they disappear from use and are taken for granted, in the remaining two ways uses of technologies and IT face some obstacles. For instance, in the perception way they are considered a whole of characteristics and structures but are not integrated in the wider social and technical context. Technologies and IT are not conceived in terms of their potentiality and their use is uncompleted and partial. In the circumspection way, even though they are not completely integrated in subjects' routines as in the understanding way, technologies and IT are implemented in the work practices. There is a continuous clash between subjects' skills, routines and technical instruments. Breakdowns and implementation problems characterise this way in which technologies and IT enter subjects' lives.

Therefore, the designing of IT should consider the difficulties in reaching the understanding way. In this proposal it might be necessary to build an environment around users that permits subjects to perceive potentialities of these technologies by a specific training for example. Breakdowns and implementation problems are normal effects in using technologies, but their planning should consider these aspects as one task of designers is to foresee breakdowns and implementation problems, considering not only technical issues but also users' habits and characteristics.

The phenomenological approach suggests a further consideration for designing technologies and IT. This is due to the fact that they should not be consid-

ered as elements cut off from the environment in which they are used, but as a ring of a chain; as components of a whole of procedures driven by the purpose of developing a specific task. It is the execution of a specific task that shapes a mechanism in which technologies are elements. For example, installations, energy, and procedures all form this mechanism. Therefore, the design of technologies and IT should consider the execution of a specific task in its complexity and adapt them to the context formed by interconnections between technologies and procedures according to their functions and characteristics.

As it has already been quoted, a purpose of the phenomenological approach is to analyse how subjects make sense of technologies. In fact technologies and IT are defined as means and capabilities at subjects' disposal to pursue projects. Subjects conceive them as instruments that are part of a wider context formed by a social context with its rules, characteristics, values, habits, etc. Therefore projects are not only the result of the understanding of social contexts and of capabilities to act on that understanding, but are also the result of instruments at our disposal.

In this proposal the design of technologies and IT should consider these aspects as they can be used and conceived differently according to different social contexts. Furthermore, subjects can interpret the same context in different ways because each of us pursues his/her own project despite we share a specific social environment. As a result of this, technologies and IT can be interpreted differently and this should be taken into consideration in the design process.

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