

The Role of Technical Objects in the Knowledge Process

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Abstract – Culture and knowledge are articulated and marked by the interaction of man with Technical Objects (TO). The development of TO has reached such a potentiality and effectiveness that allow them to act as autonomous subjects. The essence of the technique is “showing” itself as a particular kind of causality, as “fate of a revealing”.

An education that keeps pace with the evolution of TO presupposes their express “recognition” as “participant subjects” in the educational process and as “active subjects” in a no longer co-operative and subordinate role.

In the man-TO dynamics none of them acts autonomously and then, as a result, the “Actants”, i.e. the agents of an action, entities capable of acting, whether they’re people, animals, objects or concepts, change their relationships according to the situational context in which they operate. The Actant is always the result of a network of relations that denote it. It follows that any Actant that is physically or virtually present in any educational, communicative and didactic dynamic, takes on a prominent and interchangeable role from time to time.

Keywords – Didactics, Distributed Cognition, Knowledge, Technical Objects.

I. INTRODUCTION

Simondon retraces some historical tracks of separation among man, nature and culture and makes the example of the countryman, describing him as a being integrated into a natural system of existence, as opposed to that of the city that is linked, on the other hand, to the social and cultural future [1].

In this context we can already identify a contrast between TO, integrated into the culture-nature dynamics of the countryman who uses them as prostheses, and the TO used by the modern society, in which the technique, because of its hardness, is perceived by humans as artifice/contrast, with its highest expression in the assembly line.

For Michelstaedter no longer exists the man but it has turned into man-machine. Every technological advance makes stupid man. For the goriziano thinker, science, understood as technical, must be fought as more inauthentic form of human existence, because it amuses man, the technique distracts him from the true understanding of practical life and the understanding of the self. In contrast to the analyzes and assessments of the Gorizia philosopher, Heidegger believed that the technique is directed toward nihilism as its antecedents are marked by a particular mode which sees “the being as a being manipulated, and reason as rationality than technical purposes”. Heidegger, from 1953 to 1968, frequently returned to the question of technique, but above all to emphasize the advance of philosophical concern about the unpreparedness of thought in the face of the era of technique.

The technique doesn’t open up scenarios of salvation: the technique just works.

Since its operation takes a global dimension, the concepts of individual, identity, truth, meaning and purpose, but also those of nature, ethics, religion, the historical consciousness that appear on the existence background in the technique age will have to be reconsidered or re-created from the bottom, from the roots.

Said this there is a new dimension of man which must be attained, Nietzsche calls him *Ubermensch* [2]. In front of the discovery that all metaphysical remedies, ideological and moral put in place to save themselves from the unexpected and the fear of the unknown are comforting lies, the man is in front of, for the first time, to the reality of a world which is pure chaos, but also pure becoming; the Superman accepts this evidence, has the strength to accept the unknown and the unpredictable without resorting to illusory remedies. The Superman is aware of his fate, loves it, and runs it with strength and vitality.

In this Darwinian evolution process, the process of emancipation of theory from practice of the countryman is well described by Nietzsche [3], in which he outlines the preference of the modern age for the order and rationality, the “apollonian spirit”, at the expense of the “Dionysian” one that is instinctive and irrational, with the consequence of bringing the technique at the top of its possibilities, until making it become the most powerful tool of transformation of the world, tending to break free from human control more and more.

Are there nowadays the bases for reconciliation between man and TO? In order to advance a hypothesis on this matter, it needs to understand what are the TO. They reveal and unfold themselves more and more in their autonomy, confirming Heidegger’s logic statement: “The deepest essence of the technique is nothing technician”. Rather than remain simply fascinated by what’s technical, it needs to grasp its essence. “Until we mean the technique as a tool, we also remain linked to the desire to dominate it. And in this case, we don’t get the essence of the technique without recognizing it” [4]. In fact the real essence is evident in what enables man to take part in the unfolding: the essence of the technique is highly ambiguous. This ambiguity recalls the mystery of every unfolding, thus of the truth.

Today we are no longer the ones to give trust to our objects. With such complex functionality that is no longer returnable to the humans, they take it without waiting to receive it.

In the advanced modernity, the technique is gaining ground more and more. It meets no obstacles or impassable boundaries. And, contrasting itself to nature, gains cultural autonomy and the domination on man at the same time, making him a prey to the assembly line and the industrial pollution through a violent relationship. The

technical object, thus, presents a strong, inherent, hard component, represented by the severe face of the industrial society.

Wiener himself, father of modern cybernetics, has developed an overall framework of the “existing”, based on the detection of the endogenous mechanics able to guarantee the functioning of the inorganic sphere in equal degree of the organic one.

According to Wiener, however, the TO, interacting and communicating with humans on the basis of their functional operating processes, guarantee the gradual release of the human subject from the “necessity” and the subjection of the material work, allowing him a total deployment of the cognitive potentialities [5]. Therefore, considering that the endogenous processes are common both to the functioning of the machines as to men, these two agents may be perfectly harmonizable to ensure the effectiveness of exchanges between instrument and “user”. So, in the educational field, where is it possible to get all the inherent potential of this relationship? They are revealed in the dynamics of the three-way relationship, Student-Teacher-TO, in which each of them play an equally important role.

Our world is, therefore, the world of the technique. Its presence has permeated every aspect of our lives so much as to make it an essential part of it. This has brought about a qualitative change in our horizon of meaning. “For the fact that we live in a technically organized world, the technique is no longer the subject of our choice, but it is our environment, where ends and means, goals and ideations, pipelines, actions and passions, even dreams and desires are technically articulated and need the technique to express themselves” [6].

II. TECHNICAL INSTRUMENTS IN THE INTERDEPENDENT RELATIONS

Every tyranny knows that in the long run will have to find elements of mediation and integration in order to avoid the unease and an uprising of its subjects. With a soft revolution, the TO have turned themselves from human rulers in their prudent and integrated “companions of daily life”.

Just think of how the technique is suited to man; In fact, from the assembly line, the technique has created robots which delegate more exhausting jobs.

The most important part of a construction is the one we cannot see; the same happens for the contents and meaning of the TO. This discourse today is particularly elusive because, if on the one hand we are faced with a technique that is no longer subject to the will of man, on the other hand it would be excessively simplistic to believe that the technique is fully released from fate and by the will of man and goes on its way according to its own inscrutable purpose.

The technique, in fact, is set within a relation of use, as a new Proteus. There is no possibility to determine a precise and unambiguous relationship between man and TO. The TO take part fully and with equal dignity in the shimmering determination of the cultural, symbolic,

ontological and axiological order. The TO and its use leads to a dynamic of constant revival and reinterpretation, generating, in this way, new meanings that are not intended nor desired [7].

In Nietzsche’s conception, arts take an important value of human release from the oppression of rationality, understood in its representation as a technique, allowing the individual to express his creativity in a world that tends to destroy it.

We are at a stage and in a field, the one of education, in which the objects are no longer only extension tools of our sense organs and even hostile rulers of our daily lives. They become not only devices capable of operating autonomously without interaction with humans, but in their last proposal, they interact with the subject in a dynamic that mutually affects behaviors, guides them in their development and determines the quality of life.

In an analysis that is rooted in Nietzsche’s thought and goes beyond it, Simondon highlights how the escape route identified by the German philosopher can better, and with more regard for the modern spirit, be represented by emotion. The man will not be released by arts but from the feeling of emotion/pleasure produced by the emotional combination between TO and man. The reconciliation becomes possible and the recursion of origins occurs again as the reachable goal.

The TO is not dominant but neither dominated. It acts as a mediator between the organism and the environment so to make the relationship between man and TO inseparable.

The development of technique has determined an interrelation and interchangeability between man and machine that gives them a specific ability and behavioral potential.

In this man-TO dynamic none of them is completely an autonomous author of the action; thus, as a consequence, the “Actants” [8] change their relations according to the situational context in which they operate. Thus, the “Actant” is always the result of a network of relations that denote it.

Therefore, the TO gain their sense in the action as part of the relations; in this activity they are characterized and play the determining role of the “operational entities”.

It is evident, therefore, that the result doesn’t belong to the elements or properties of humans or TO, but to the relations of “mutual reference”; this is the only way the TO expresses its “articulation of sense”.

III. THE DISTRIBUTED COGNITION AND TO

So a didactic dimension should simultaneously take into account on the one hand that young students are digital natives and on the other hand that the technical objects have triggered a parallel assimilation and integration processes.

Studies on the Distributed Cognition see in Hutchins’work, since the mid-80, an attempt to analyze the complexity of the knowledge building processes that goes beyond conventional approaches. The concept of Distributed Cognition, in fact, proposes an amplification of the concept of Situated Cognition, as it takes into

account both the material and immaterial components of the environment in which learning is developed. The Distributed Cognition approach represents a new paradigm for understanding the processes of conceptualization [9].

The theory of the Distributed Cognition believes that the cognitive and interactive processes have a decisive reference to the material environment, in the available tools and technologies, as well as in the interpersonal communication. The TO in education, as new Proteus, are presented in a relation of use and activate motivation, because their language is more immediate and closer to the cultural experience of the “digital natives”. Thus the cognitive processes are enabled and supported not only in the group and their interactions, but also in the structure and material and technological infrastructure of the environment.

Therefore, it appears immediately evident that the structures and infrastructures do not play an objective and impersonal role, which is somehow unchangeable in any situation; the ways and purposes with which they are handled and used in the interactions among the social actors on a linguistic, corporeal and gestural level become decisive. Gestures, tools and speeches generate a complex public representation supporting cognition, meant as events building, and determine the action [10].

By way of example; to bring the contribution of this conceptualization in a pedagogical context we could say that, in addition to foster the storing and individual knowledge, it needs to promote the ability to act in a wide ‘cognitive system’ can establish that can set appropriate relationships between all the components of the environment, that are dynamically and contextually inductors of knowledge.

In everyday life we all work drawing from the distributed knowledge through external supports and artifacts, such as a dictionary to complete a translation or a spreadsheet to make a simulation, a text to consult to give an answer.

Each subject that is physically or virtually present in the communicative dynamics takes on a prominent role from time to time, and the human one is not always dominant and privileged over others.

The core that makes “humanizable” the whole process is the practical intelligent use of the TO, both during their design and implementation, and then during their operations.

Making experience with the TO determines, in the subject, a motivation to use that object in the best way and optimize his know-how. This type of involvement within the task makes the practical intelligence a determining, potential and intentional factor in the use of TO.

The practical intelligence is rooted in the body and the involvement of the latter is instilled within the task, all this can be found in the fact that in unordinary and/or changing situations, the subject is moved by the sensory perception which is a fundamental part of him; the body moves towards that activity as the senses (such as a noise, smell, vibrations) are in a state of alert, and hence all the body becomes involved, everything provided that there is a prior experience of the ordinary working situation lived by the

body as a whole [11]. And so the body activates a practical intelligence in order to solve a problem and find a solution. The preeminence of the perception of the practical intelligence is fundamental both in its activation and in its intentionality. It follows, therefore, that the operational intelligence plays a prominent role and is not different from that of reasoning, of abstract thinking.

It seems appropriate to make reference to Gershenfeld’s studies, as he highlights how the TO have become increasingly clever; in fact, the author, who is a technologist, talks about shoes that communicate through somatic networks, printers that produce functional stuff instead of static objects, coffee machines that already know what kind of coffee the person standing in front of them wants to drink, hot water heaters that are activated in the house when a person feels cooler, so there would be many and many examples to make.

Gershenfeld hypothesizes that our personal computers will be joined, in our homes, by the personal fabricator very soon, three-dimensional printers able to assemble real machines: in short, meta-instruments whose existence has long been one of the great themes of science fiction [11]. The digital revolution has produced a large gap between the virtual world of the bits that has created and the physical world in which we live; we are on the eve of a major innovation of computation, which goes beyond the digital world by integrating it in the physical world of the technological fabrication; this time, it will be the physical world to be replicable. Yet Gershenfeld himself comes to the conclusion that these machines should be redesigned starting from the assumption that their task is to do what we want, and not the other way around [12], and this is where the preeminence of human intelligence comes back, the active protagonist of the relational processes with the TO.

The reason is simple, the practical intelligence doesn’t focus on the process, but on the result of the actions, it makes a mockery of the rigor, so to be defined by Dejours “cunning intelligence” [13]. It is evident, then, that we are faced with a dynamic of mental/operational structures that are connected from the central to the peripheral system, from the body to the brain, from man to TO.

Today’s commitment of those who want to deal with the role of the TO in teaching is to take into particular account the emotional aspects that are activated in relation with the technique, which is no longer presented as mere prosthetic tool, but as an emotionally interacting subject with humans.

IV. TECHNICAL OBJECTS IN THE RESEARCH FIELD

As equal to a human being, the TO needs to be focused and contextualized in order to act. A TO without a specific aim is totally useless. Thus it is necessary to have an end-user who embodies the technical project in order to avoid a failure.

Only a full physical contact realizes the technical object, otherwise we are faced with an unsuccessful technological determinism.

It is not enough to investigate the needs of the users of technical objects. We must monitor the use between their planner and user to understand the actual interactions that are determined in various contexts and to fix them.

We will show two examples of the use of TO. The first one sees a deterministic approach of the TO; the second one, on the other hand, has an interacting dimension with humans [20].

The failure of the photovoltaic kit.

To enlarge its market, the AFME, a French government agency, has designed for French Polynesia a photovoltaic kit depending on the needs of this population.

The kit features were ease of use and safety; the essentialities of the system were: a photovoltaic panel, a battery to store energy, bulb and connecting wires; according the designer, this kit had to work notwithstanding the actor end-users as they're not capable of manage and maintain them.

The negative aspects were determined by the following aspects: the wires were all the same and not adaptable to various types of houses; there were difficulties in replacing some parts (bulbs and batteries) which were available only in the capital. Even knowing how to work on the device, the population could not do it for lack of consumable materials for which what was familiar was also seen as stranger.

The closed-circuit kit did not allow, for security reasons, appropriate interventions and finally there was the inability to build a social network (end-users, local technicians, marketing, managers, etc.). Everything was delegated to TO! So the kit was abandoned.

Here's a Situation of Contextualized TO:

Genset units (functional project)

Genset units and materials like bulbs, turntables and amplifiers are distributed to youth associations of Senegal.

The associations provide the genset unit for parties or initiatives where it needs electricity in exchange for the payment of fuel.

A part of the income of the rent of the genset unit was for the association, the rest was for the carriers.

The metal bodywork allows its carrying and builds a social relation as well as the petrol tank.

Then, other elements are involved (administration that provides the group, the association that manages it, carriers, fuel suppliers, end-users, etc).

It all happens in a continuous and dynamic relationship between the various elements, enabled by the TO (genset unit) and constituting a social and technical geography.

The group is integrated in social life with specific relational roles.

The TO is a social mediator because the elements are involved and accept the roles offered.

Let's Analyze the Reasons of the Failure of the TO in Schools:

The positive aspects involve the relevant economic investments (Italian Ministry of Education, University and Research, Regions, etc.) in the TO (tablet, computer, LIM, etc.)

Aspects that have determined its failure: scant investments in education; lack of comprehension in an appropriate didactic-relational theory.

Assessment considerations: The administrative apparatus, while understanding the importance of the TO in social life, fails to take account of the diversity of the class relations from those in society.

Everything is miraculously delegated to the TO in the kit, seen as carrier of deterministic- technological functions, ignoring the human/non-human relationship.

In this context the "client" (Italian Ministry of Education, University and Research) does not take account of the relationships between the various players on the field. The "tribe" of the school receives the gift of the TO but not the "teaching" use instructions. No account is taken of the end-user, who has to embody the technical project; therefore, as a consequence, this project fails.

Conditions of School

Actual didactics

At best, account is taken of a "situated cognition" that enhances the interpersonal relationships (teachers, students, social knowledge).

"Didactics of the TO" proposal

It would be useful to give start to a didactic that refers to the "Distributed cognition" (Hutchins), as it takes in consideration both the Actants and the subjects of the Situated cognition.

It needs to appraise the activity shared with the TO, since the cognitive work is: distributed among the people; present in the environment, since knowledge is not settled only in the mind of an individual but is distributed on social culture; projected in time and space but also among people and TO (human and non-human subjects).

V. CONCLUSION

The theory of Distributed Cognition believes that cognitive processes are interwoven into the material environment, the technologies, and the interpersonal communication. So the TO in didactics can encourage motivation, because their language is more immediate and closer to cultural experience of digital natives. So the cognitive processes are activated and supported not only in the group and in its interactions but also with the structure and infrastructure technological.

It is a theoretical approach that, rather than focus solely on internal cognitive processes or only on technical aspect, highlights the interactions between people, objects and representations both internal and external, in a "cognitive system" broadened and at the same time include verbal and not verbal behavior. The relationship with the OT, referenced by this educational axis, determines a Copernican revolution within the educational dimension, a passage from the Darwinian evolution of species to Anthropotechnical evolution of species.

This determines an implicit and a "magic imprinting" tied to the self-education in dialogue with the OT.

The TO, in their function of bodily-cognitive prostheses, are part of the activities in the processes among social actors, the Actant. For this reason the theory of the

“distributed cognition” is the most appropriate to take into account the didactic process and activities.

The TO in their function of bodily-cognitive prostheses are part of the activities of the processes among social actors.

The theory of the “distributed cognition” takes full account of not only of people, but also of the environmental/material instruments, both on a communicative and a cognitive-bodily level, since in the cognitive processes are constituted the representations formed by the sensory structures, particularly by the visual and auditory ones, whereby the “distributed cognition” shows itself as the most appropriate to take into account the didactic activities.

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