Digital and analogue memory: a theoretical and historical framework for e-learning

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Abstract
The digital revolution has exposed cognitive and mnemonic functions: in this work we discuss the concept of collective memory not so much in terms of sharing opinions and events, but in terms of memory as container, support, custodian and origin of one's own individuality. We attempt to hypothesize the potentialities of connection and sharing of the self on the Net, focusing specifically on the issues and impacts that these findings have on e-learning and digital learning.

Keywords [1]
Self, potential, sharing, e-learning, infosphere

1. Introduction

The reflection on teaching always opens up unexpected horizons and allows us to glimpse paths leading to the analysis of the processes involved in the construction of the Self, and to weigh in on the themes underscoring the emancipation of personal identity. Precisely for this reason, the range of problems that it is useful to examine (and solve) before planning teaching courses is really wide. In this case, in fact, long-standing questions return, concerning the meaning of identity and the role of the teacher and of the learner, or, more generally, about the very idea of person and of his possible identity when encased within a digital universe. On the other hand, already twenty years ago, in 1998, a collection of essays by TW Bynum and JH Moor [1] foreshadowed in which way and how much computers were changing philosophy, meaning by *philosophy* the questions, methods and models referable to the mind, to the consciousness, the sensory experience, the thought, the concepts of truth, ethics and aesthetics.

2. Memory in the infosphere

The main argument of the reflection (and also the most current one, or perhaps - at the end of the twentieth century - simply the most prophetic one) sprang from the awareness that the digital revolution was changing the world more radically and more rapidly than it happened with the Copernican revolution, irreparably altering the understanding of the nature of man as a social and political animal and, even before that, the understanding of the nature of the universe: in the era of the information revolution, the human being becomes defined fundamentally as a digital entity and, similarly, space-time as the ultimate fabric of reality becomes computational space-time. The

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hermeneutic horizon that opens up in the digital age is therefore inhabited by the concept of information which, like concepts such as being, knowledge, good and evil, is autonomous in its ontological and metaphysical dignity, and by the computational bit which is the new archè, the ultimate foundation of language and reality. More precisely, we would say, the modern human being is defined by information that, despite having, in our opinion, the characteristics of a Parmenidean Being (as opposed to a non-Being that is nothing but absence or negation of any information) is basically a sequence of computational bits.

In other words, the hermeneutic horizon that opens up in the digital age is a horizon characterized by what Luciano Floridi calls infosphere [2], or universe (or already multiverse) of the informative man, or informant, bearer of information, capable of information and capable of changing the surrounding environment with information, just as millennia ago it changed the environment with the use of the thumb.

Such a universe is governed by intrinsic ethical laws which essentially tend to a moral imperative that Floridi summarizes in an informative well-being that must be promoted by extending (quantity of information), improving (quality of information) and enriching (variety of information) the infosphere [3].

Now, if it is true that in the digital age a human being is essentially a digital entity, it is clear that the main condition of his existence, that is, of being there, can only coincide with his ability or possibility to give and receive information and to be in the world (in the world of information, which in this case would coincide with the world tout-court). In the information and in the possibility given to humanity to handle and share it, one can therefore glimpse the essence of contemporary humans, already identified by M. Bakhtin, for whom "the existence of man (both the visible, outer one and the subjective, inner one) is a very profound communication. To be means to communicate."[4].

Analysing, therefore, the new posture of the human in the infosphere, we come to the awareness that contemporary existence is in fact an *onlife* existence [5], where online and offline are in fact overcome or perhaps cancelled, because they are engulfed by the collective expectation that individuals are given a single condition: either one is connected, capable of exchanging information (regardless of how one is online), or one is not.

The digital dimension leads man towards forms of collective intelligence [6], which redesign new social and political identities, not on territorial, geographical or institutional belonging, but on adherence to common interests (including playful ones), and from collective intelligence to forms of distributed intelligence that, not by chance, De Kerckhove named connective intelligence [7], that is, capable of producing knowledge given by the multiplication (or even exponentiation) of single intelligences interconnected by a network of relationships, and not by the mere sum or average of them. This corresponds to the noosphere theorized by Vladimir Vernadsky [8] and of which Edgar Morin [9] also speaks, that is a sort of collective consciousness arising from the interaction of human minds organized in increasingly complex social networks.

In fact, this complexity does not need to be digital, but it is certain that the digital revolution has increased this complexity, making it at the same time rationalizable, penetrable, decodable, we would dare to say.

The semantic evolution of some words appears emblematic in this context.

Let's think, for example, of a whole series of expressions that are configured around the adjective *digitus*, and that certainly occupy a central place in the computer age. For us, *digitus* is Latin for "finger", a lemma that has somehow undermined the cognate Greek *daktilos* which instead flourished in the times of the typewriter. Today, many languages prefer to reinvent similar terms by borrowing from the English version of that root, which, even though is a direct descendent of the Latin one, somehow leaves in the shadows its semantic origins and links the digit (and therefore also the "digital" derivative) to the numeral character. The whole discourse on the infosphere leads us to take note of a conspicuous externalization of intelligence (supported and unveiled by the Net), and therefore of a way of thinking that emerges, precisely in the sense of that being projected out, and that in some a way we expect to interpret in the educational concerns of those involved in training within

the digital universe. If for McLuhan the technical artifact (of the electric age) was nothing more than an extension of our limbs and our senses [10], for De Kerckhove (a mentee of McLuhan) the Net (in the digital age) is an extended form of thought, an extension of intelligence joint with an extension of private memory that manifests itself as collective memory [11].

Reflecting on these aspects leads us to confirm the idea that the worst failure that may be experienced in the practice of online teaching can only stem from the model of Skinnerian linearity that was so generously accepted in the first experiences of online teaching and that however, in the final analysis, is essentially due to a completely incompatible universe of thought, because it is still coldly mechanical and rigidly sequential. There is also a form of visualization of the mind to be taken into account, which becomes a visual phenomenon and, indeed, an icon. What used to be inside us - writes De Kerckhove - is now on a screen [12]. If the Net is the extension of the Nous and is also the prolongation of the memory linked to it, as well as of the organ of sight, then the Net is also the repository of a new form of identity that qualifies and defines the human, an identity also collective and connective, primarily digital, which broadens and amplifies the already indefinable boundaries of the analogue identity.

3. Connectivity, a resource of e-learning

The notion of connectivity that we have just recalled, following the lesson of D. De Kerckhove [13] deserves some further study regarding the dynamisms that develops within the digital context. Since the times of cavemen, the invention and use of new tools has in some way conditioned the human behaviour and has interfered with the organization of individual and social action. If this could be said about the club, as well as for writing and the printing press, then one can't see why it shouldn't also be said for the tools that create the digital world.

Surely writing has not only given us a manual ability, but, as D. De Kerckhove says, it has shown us the possibility of classifying and ordering thought. And thus the digital universe or the systematic use of new communication technologies cannot fail to have an immediate impact on the ability to develop new mental models and structures, i.e. new and different ways of functioning and therefore, ultimately, new procedures for elaborating thought and organizing behaviour. The media, underlines De Kerckhove, are those who overturn the linear categories of the current digital season and re-propose on a global scale meetings similar to those that took place in the villages, creating a new circularity with virtual borders.

Undoubtedly, the extraordinary power of connectivity frees the intelligence from the reductive schematisms of discursive linearity, opens wider spaces to creative intuition, allows procedurally more complex elaborations, which take advantage of networked connections. This does not mean being dominated by the Net, but to embrace the network model, in which the paths branch out and experiment with new procedures, even new demonstrative procedures.

We say "new", but with a lot of discomfort. Logic and, more generally, classical philosophy had already discovered, for example, the so-called abductive thinking. Then the scholastics allowed themselves to be fascinated by the potential in terms of rigor, efficiency and ease of verification offered by deductive demonstrative thinking, and that was preferred to the form of reasoning that develops through multiple connections. Now, however, with the resources of the Net and with knitted cognitive models, abductive thinking becomes productive, fertile, fruitful. Closely connected to creativity, abductive thinking has been described as associative, complex, creator of metaphors and imaginative, close to affective states, with a strong spatial component, similar in some respects to the functioning of the right hemisphere. Abductive thinking is intertwined with that perceptive modality known as synesthesia, that is the ability to experience reality through the simultaneous activation of multiple perceptual channels; especially virtual reality seems a promising medium in this direction. The frequentation of virtual environments is always accompanied by the development of this specific type of thought, which is added to - and integrates with - the more well-known forms of inductive and

deductive reasoning. Abduction leads along paths marked by a reasonably high probability or, as some say, by a reasonable certainty.

Its progress is characterized by a succession of connections and not by a linear sequence of irreversible links.

All this must be said and emphasized when confronted with online teaching, because a sort of stumbling block has occurred in this area, certainly understandable and in many respects even useful, but from which it is necessary to quickly free oneself. Too much attention was devoted to didactic organizations tributary of linear thought, while neglecting for the most part what was becoming manifest in the spontaneous development of the Net, carrying a strong charge of suggestion. It happened that at the beginning of the e-learning experience, we obviously treasured what had been usefully tested in previous epochs, before the advent of digital, when distance learning was "disciplined" and organized with models of the so-called programmed instruction, mainly subservient to linear models of the Skinnerian type [14] which were best associated with "assembly" procedures that were easily accessible and easily manageable by teaching machines, due to a rigidly mechanical type of operation. The transition towards more elaborate branched-type models - in the manner indicated by Sidney Pressey [15] or even more complex ones, enriched by feed-back - in the manner envisaged by Norman Crowder [16] was not yet possible: there was the need of an appreciable cultural development, of a greater epistemological awareness and of a more articulated technological context, such as what we now call the digital universe. Today, surely, all three of these conditions exist and it is possible to design and teach courses with a "reticular structure". Here we say structure to indicate not the framework of the teaching material, but the way the teaching / learning relationship works [17]; and it is said to be reticular to remember the type of organization of the contents: an organization that has in fact passed from the tree model to that of a graph or even a map and a three-dimensional map.

Just as the technology of papyrus and of pen-writing represented the felicitous support for a first and effective philosophical and conceptual literacy, accelerating the decline of an oral and mythical culture, so today digital technologies represent the support for a new philosophical literacy, which can exhaustively take place in the interactive space of the Net and in it or through it to find new expressive paradigms. The operation was facilitated by the unexpected, but very opportune, analogy and similarity between the Net and philosophical reasoning, indeed between the Net and the highest form of philosophical discourse, namely the dialogic form. In fact, if the most intuitive geometric description of the discourse allowed by the paper support, and in general of the written alphabetic processing, is the straight line, a very precise sequence of chained links that take place according to the principle of causality and order, the geometric metaphor that describes the Net is a graph, or a network, that is a structure that allows multiple, non-linear and potentially cyclic connections between different multimedia documents, and, as a consequence, between different ideas.

In the Net, a text becomes a hypertext in the same form and with the same modalities with which writing in philosophy became dialogue in Plato's time. Today, teaching entirely offered through the Net and in online mode must necessarily interfere with (and modify the) logical connectives that support it and accompany it in its unfolding [18].

A transition of this magnitude already happened with Plato, who, by transforming orality from a primary and apparently unique condition of dialogic exchange, into a precise, highly original, mode of writing, obtained a new dimension of writing that was able to account for orality, translating it into a graphic sign and inner dialogue until it became paradigmatic and accessible to a new and wider audience. With the format of dialogue, Plato was able to respond to the inevitable disorientation that a culture immersed in orality, interwoven with orality, would inevitably have experienced in the face of a written philosophy. Not only he knew how to reduce that disorientation (which belonged to him in the first person, if we take into account his resistance manifested unequivocally in the Phaedrus and if we take into account the most important biographical data, namely his long, more than ten-year, frequentation of Socrates, master of orality) but has been able to produce meaningful texts, that is, permeated with meaning, for every reader in potency and act.

4. The universe of lattice connections

Not even the ego is linear, just as the mnestic framework that supports it is non-linear. It is impossible, in fact, for human memory, to construct itself in lines, in rows, in zones, and to organize itself according to a fixed pattern (as if we could store here a childhood memory, there an old flavour, and yet in another pigeonhole the birth of the first child), because the memory proceeds in a completely different way: in the Proustian way, within our memory everything is linked to everything else and even insignificant details disconnected from any context stimulate the most remote memories, apparently forgotten. In other words, memory is the container of the vast ego that crosses (and is crossed) by the ocean of memory itself (sometimes shipwrecked there). It is the container of the perception of individual and subjective time that does not pass, does not flow and does not roll, but stays, inhabits all the spaces of our "storage device", pervades the atmosphere, determines it and, while it rests in all the ravines of memory, constructs our identity, through all the moments of memory. For this reason, in a learning machine context, a learning machine could never use oblivion in the Proustian way: the machine either binds two facts indissolubly to each other and therefore remembers (in the sense that upon the appearance of one, the other also appears) or does not remember, but could not remove a fact anchored in the memory system and then recall it for the casual flavour of a madeleine. An algorithm remembers the title of the latest books purchased online and suggests other similar products, but above all, it will never forget the relationship that will automatically be established between the user profile and its preferences, repeating this relationship slavishly. From the existential point of view, memory, on the other hand, is an enormous, unbounded, indefinite container of its opposite, of non-memory, or of oblivion because memory is present to itself with all of itself, with the traces of what we have forgotten: both these dimensions (memory and oblivion) build the personal identity that branches out and extends along the entire labyrinthine network of memory.

Three major areas of discussion can be identified here.

The first is the epistemological difference between digital memory and human memory. The first has a space that, although it may be enormous, will always prove to be finite and will therefore require, periodically, to be cleaned in order to be reused, under penalty of saturation. Human memory, on the other hand, seems to have a space directly proportional to the content laboriously poured into it: the more mental objects are stored in it, the more it expands, the less mental objects are stored, the more it atrophies. This fact, in itself, acts as a structural value of the overall memory profile, even beyond performance and aspects of efficiency.

The second is a psychic (and, dare we say, emotional, emotional) difference between digital memory and biological memory which raises the issue of the risk of the inevitable adaptation that human memory (both private and collective) undergoes when it is pours into digital form: the translation of information, in fact, seems to solidify. Within the digital cloud of knowledge where we cram our information, a real trauma of digitization is generated: the loss of everything that is not translatable, transferable in binary mode. If a content (in images, in video, in agglomerations of bits) from digital is re-encoded into analogue (that is, if from a photo or video we wanted to proceed towards an exegesis and then a hermeneutic of meaning about the represented subject), we would see, semiologically, a loss and a detachment of meaning, like a text that, translated and retranslated from one language to another, loses pieces of signifier.

The third argument concerns the inherent risk in the digital memory of an information overload, where oblivion is given not by the lack of information, but paradoxically by its excess and where that oblivion, far from being foundational and founding for identity, rooted and branched into identity, no longer translates into a psychic substratum but into a sum of bits which, if cancelled from any digital medium, either no longer leave a trace (as if they had never been in the world) or remain in spite of our willingness to forget or to be forgotten, so much so that for some time now an ad hoc legislation has been enacted to safeguard the right to be forgotten in the digital age.

There is also a fourth nucleus of great research fertility: that of neurosciences which certainly found feedback or reinforcements or only stimuli from the parallel progress of the study on the development of the mind and technological innovation, especially that directly referable to memory problems.

During the eighth Congress of Siel-L, G. Vivanet clearly felt the need to compete with a real theory of "semantic learning" and tried to give some essential features [19]. In fact, a series of investigations lead us to believe that the relationship between the tools and the minds of the individuals who use them certainly serves to carry out certain tasks and to effectively activate certain functions, and yet it also becomes a useful promotional factor for the development of cognitive faculties, as had already been hypothesized by both J. Piaget [20] and J. Bruner [21], or, with a fully different approach, by LS Vygotsky [22].

We also cannot forget here that past philosophical thought paid attention to the same problems, even in seasons certainly far from the technological wonders of the digital universe, for having always postulated certain extraordinary interconnections between a person and her habitat.

The time has come to grasp and treasure the possible analogy between the structure of digital memory and the functioning of our ego: on the one hand an inanimate organism made of bits and pixels, but arranged in a dynamic and complex network, and on the other hand an entity, also also composed by complex of relationships arranged in a mesh, as in a network of connections. We find ourselves in the middle of an inner "here" that is never separated from the outside, while remaining secluded, in an area that we call intimacy.

And it is interesting to underline how the construction of intimacy through the fragments and paths of memory (away from the stage of exteriority) does not represent a passage towards solipsism, but an important goal (or, better, a transition) on the path towards personal maturity, and along the path of humanity, which approaches the exit from a primitive state, inhabited by myth, to an adult state, inhabited by logos and reason.

5. Conclusions

In summary, if we acknowledge that the digital world has the potential to support a branched, networked, lattice-like, then we also have to admit that knowing the workings of the digital memory allows us to transition from the e-learning to the e-teaching: up to now we have focused almost exclusively upon automating the lectures, the classroom activities, the production of content, and we forgot almost completely to build an environment that helps the learner in the process of absorbing, comprehending and reusing those contents. The issue that must now be raised and addressed by platform designers, and, even more, by pedagogists, is rather the following: «When the user is sitting in front of her computer while following an e-learning course, *how* does she/he really learn? Are we implicitly assuming that her learning will "persist" in the web site that she/he's currently perusing, as if she/he'd be able - maybe a decade later - to come back to refresh and reuse that knowledge? And, if this is the case, are we deploying the technical, legal, and even cultural safeguards that will allow the learners to do so?»

In the time of oral culture learning was completely mnemonic; with the written text the mnemonic effort was counterbalanced by the possibility of accessing a material support (stele, scroll or book); with the multimedia hypertext we would have expected that the mnemonic effort would be further reduced, but so far this didn't happen: if anything, the effort has increased.

This means that we are misusing our digital tools, while twisting and bending our learner's learning processes in an unnatural way, because we are using the digital infrastructures as mere containers of information, as multimedia parchments of sorts, like the illiterate that uses a book as a weight, as a table wedge, or as a proxy of for any sort of other useful implement, except than for the purpose in which the book would excel. Instead, it is about time to focus on understanding what are the most

effective and fruitful ways to use the digital platforms as tools for structuring and organizing our collective *logos*, and, specifically, how to leverage their unwavering memory as a support and multiplier for the learning processes of the human mind.

This necessary investigation will need to recognize the value of the individual learner: a mind map truly helps you inasmuch you're the author of it; somebody's else mind map inevitably would result as an obscure jumble of buzzwords, far inferior, in terms of explanatory power, to a conventional, linear text. More generally, a truly effective e-learning method will have to allow for structures capable of accommodating networked fragments of digital self.

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