RISC-CNRS

« ATELIER DE REFLEXION PROSPECTIVE SUR LES SCIENCES ET TECHNOLOGIES COGNITIVES»

Thème : Cognition et technologies ; Cognition, éthique et société

Atelier n° 18
"Convergences"

Mutations physiques et cognitives chez l'homme et la machine

24-25 avril/09

Ce projet sur les « CONVERGENCES » entre la technologie et l'Homme rélève d'un domaine résolumment ***stratégique***, et ce, sur trois plans que nous pouvons hiérarchiser de la manière suivante :

1. La matière traitée ***soulève naturellement des questions d'éthique concernant notre Science*** ainsi que les technologies qui en découlent. Suscitant les niveaux supérieurs de la cognition humaine (affectivité, croyances, intentions, désirs…), les technologies cognitives ont tendance à transformer notre vision du monde et nos possibilités d'action. Cela change notre rapport aux sciences. Les couches hautes de notre activité mentale sont la visée de ces technologies.

2A. Les thèmes abordés sont ***accesibles aux jeunes qui hésitent encore à se tourner vers la recherche*** ainsi qu'aux scientifiques en début de carrière. Il s'agit d'un domaine dans lequel le rêve a sa place : c'est essentiel pour l'image de la Science, et par consèquent, son avenir.

2B. Le sujet est également stratégique en ce qui concerne les ***applications*** qui deviendraient réalisables, elles seront ***davantage en phase avec la société*** si notre activité mentale est façonnée de telle sorte que nos technologies cognitives restent fonctionnelles sur un plan éthique.

Une séléction d'articles fera l'objet d'un ouvrage de qualité (en-ligne et imprimé, *cf.* plus bas).

Nous avons intégré les enjeux sociétaux ainsi que les bouleversements possibles dans notre domaine dans la description plus bas de cette conférence —il s'agit d'un extrait de l'Appel de communications, ainsi que le programme final. Ceci dit, l'intégration des éléments artificiels dans le corps humain semble être le plus spectaculaire (*cf*. la médiatisation que reçoit chacun des membres de notre Comité scientifique —liste plus bas—), mais le comportement humain ou animal de certaines machines l'est autant par son effacement de la frontière entre le croyable et l'incroyable.

Il s'agissait à cette occasion d'affirmer la reconnaissance de notre établissement universitaire à l'échelon mondial. Dans le cadre de ce projet, des scientifiques du monde entier et de grand renom en informatique, en philosophie analytique, en réalité virtuelle, en robotique, transhumanisme et en sciences cognitives ont apporté leur contribution à ce colloque (*cf*. l'ampleur du comité du programme). L'enjeu n'était pas pas seulement pour le LAMPA Arts & metiers ParisTech d'affirmer sa renommée internationale, il l'etait aussi pour l'ensemble des acteurs régionaux face à l'avenir et à l'évolution des nouvelles technologies. Il s'agissait ainsi de favoriser l'excellence dans les études portant sur des activités économiques nouvelles.

Cet atelier de réflexion international dans une série de conférences d'un genre original visait aussi à intéresser le CNRS programme Pirstec à la recherche universitaire présente dans notre établissement. Cet événement s' est intitulé - audacieusement - *Convergeances, une conférence internationale* afin de « provoquer » des discussions interdisciplinaires. Il s'est tenu du 24 (après-midi) au 25 (journée) avril 2009 en langue anglaise principalement avec quatre interventions plénières, notamment du Professeur de computationnalisme L. MAGNANI de l'université de Pavie Italie. Les autres intervenants avaient tous au moins le statut d'enseignant-chercheur. L'audience comportait des spécialistes pluridisciplinaires. Colin SCHMIDT, Maître de Conférences enseignant principalement à l'université du Maine fut le président du comité de pilotage.

Brièvement, les sujets abordés par les conférenciers etaient en accord avec la demande de l'appel à communications :

Appel à communications

RISC-CNRS (PIRSTEC) PROSPECTIVE THINKING PROJECT, A WORKSHOP SPONSORED BY THE FRENCH NATIONAL AGENCY FOR RESEARCH (ANR) 24 (AFTERNOON) – 25, APRIL 2009, LAVAL, FRANCE

CALL FOR INFORMAL COMMUNICATIONS (100-300 WDS)

SYMPOSIUM: 24-25 APRIL 2009 (1.5 DAYS FOLLOWING LAVAL VIRTUAL)
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.MERGERS.
Physical and Cognitive Mutations
in Humans and Machines

INVITED SPEAKERS

LORENZO MAGNANI, PROFESSOR & DIRECTOR OF THE COMPUTATIONAL PHILOSOPHY LABORATORY, UNIVERSITY OF PAVIA (IT)
"Knowledge as Duty. The Mediating Effect of Technological Cultures as Human Hybridization"

VIOREL GULICIUC, PROFESSOR AT UNIVERSITY OF SUCEAVA, ROMANIA
"Wisdom of Digital Homo Sapiens. Wisdom as Negotiated Identity"

Biological and mechanical components are merging. The 'technological artefact' has become a relative notion. Computer-compelled technology is drawing closer to human life as we experience it. Human Life will undergo further movement towards technology. It would seem that the further scientists humanise technology, the more making humans into artefacts becomes possible. Since the outburst of the Industrial Revolution in Europe, attempts to explain human cognitive life away have been on the increase; the idea is to render acceptable the organisation of manifest (more or less biological) components whose human-like behaviour is guided thanks to various calculations. Whether 'building up' the Machine or 'breaking down' the human being, ambivalence prevails in the hearts of all when it comes to future issues: do we or don't we have the right to create certain things? What are the key future issues that involve the evolution of our machines and our very persons? And what do we wish to become tomorrow? Surely there are realistic goals to the activities listed above. It has now become necessary to seriously analyse the "fringe-like aspects" of the use of technology to modify human life (emergent future states & immersion into the unknown). For many, the humanisation of technology and rendering human life more technical in nature go hand in hand, constitute opposing forces, or at least occur on the same practical terrain.
Therefore, over and beyond confirmations and refutations of the humanisation-technicisation relation that exists between Society and Technology, whatever its nature, we solicit papers exploring the Philosophical, Ethical and Epistemological aspects of the simulation/modification of human cognitive and physical processes and states for this informal Symposium to be held in Laval France. The most promising will be reviewed in view of being published as book chapters in a quality publication.

The following are only examples of relevant topics:

RELATED TO "MACHINES"
Artificial Autonomy and Identity
Beliefs about Androids (having beliefs)
Humanoid Robotics and Will

Bringing Inert Matter to Life (from Galvanism to modern-day approaches)
Mechanical Playmates and Emergent Affectivity
Authentification of "Soul" in Artificial Creatures

RELATED TO "HUMANS"
Cyborgs and Problems of Trans-humanism
Bionics, Augmented Human Cognition and Consequences
Mutations, Cloning and the (Im)possibility to Socialise Evolutionary Beings

RELATED TO COMMUNICATION
Problems of Communicability with Artificial Creatures (incompatibility, theories of Reference)
Personification of Non-persons
Acceptance of Inorganic Individuals
Artificial Intentions and Human Intentionality: Limits and Barriers to Establishing Co-intentionality
The Social Status of Agents and Robots, Legal Issues (rights, personal obligations and morals)
Human Digitalisation (difficulties related to the de-incarnation of the Self; personhood, otherhood and sense of community in virtual settings)
Technology-induced Indecidabilities, Multiple Personalities, Existential Trauma
Suspended Beliefs Hindering Contact with the "Other"

LOGIC, CATEGORISATION & INTERROGATIVE ARGUMENTATION
Un-technicisation of Humans
Possibilities and Reasons for De-humanising Technology
Classification(s) of Humanoid Robotics, Artificial Life, Self-transformed Humans, etc. (conceptual graphs, typologies)
Post-cognitivism, Discursive Mind Theories and Post-humanoid Robotics
Statements on What Humans or Society Might/Should Become
Technological Era Positioning or Pragmatic Contextualisation (of all the above)
Re-definitions and Life

All other analyses of formidable, incongruous or complacent amalgams between humanity and technological matter are welcome. We also wish to discover texts referring to European Projects (FET Programme, ESF Forward Look Workshops, etc.) on like matters. Position-type statements (1-2 pages or a simple expression of interest) with respect to the concepts eluded to here are particularly encouraged in this forum as well as historical accounts as a basis for extrapolating into the future. Although attendance will be subject to relevance with the Mergers Technical programme, the entire event will benefit from the finest media coverage.

IMPORTANT DATES
STATEMENT DEADLINE NOW TILL MARCH 5TH, 2009 --> COLIN.SCHMIDT@UNIV-LEMANS.FR
NOTIFICATION OF ACCEPTATION MARCH 15TH, 2009
CONFERENCE 24-25 APRIL 2009 (1.5 DAYS FOLLOWING LAVAL VIRTUAL)

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SCIENTIFIC COMMITTEE

Voici le programme de cet évenement scientifique :

Mergers 2009 Laval, France

International Prospective Research Seminar in Cognitive Technologies

is organised by
ParisTech (LAMPA) & Pirstec CNRS

Auditorium, Salle Polyvalente, Place de Hercé, Laval (on the « rue de la Halle aux Toiles » side)

Sponsored by PIRSTEC/CNRS – l'Agence national pour la recherche (ANR) –
Institut des Sciences de la communication du CNRS

Held in cooperation with Laval Virtual

Plenary Speakers

Session Presentations

To telephone the site: +

Session I Session II Session III

	session one *Communication & Logic*	session two *Humans*	session three *Machines*
14:00-14:45	**Friday April 24th 2009** ***Afternoon*** Registration in the main hall		
14:45-15:35	Plenary Session Chair: Colin SCHMIDT **Topic Stimulator** Lorenzo MAGNANI Professor & Director of the Computational Philosophy Laboratory, **University of Pavia, Italy** *"Knowledge as Duty. The Mediating Effect of Technological Cultures as Human Hybridization"*		
15:40-16:25	Coffee Break –Chateau le Bas du Gast, Gîte, 6 rue de la Halle aux Toiles, Laval (across the street)		
	Session I, Communication & Logic Chair: Colin SCHMIDT	**Session II, Humans (same room)** Chair: Colin SCHMIDT	
16:30-17:10	**Michel FAUCHEUX,** INSA LYON "**Cybernetics & Golem Inc.**"		
17:15-18:00		Alexander **VOISKOUNSKY,** Moscow State University "On Psychic Development in the IT Environments"	
18:05-18:45	**Olga LODOMBE,** POITIERS UNIVERSITY "From The Technological Bluff to Building a Cybernetic Human : Which Epistemological Approach for Improving the Human-Machine Relationship?"		
18:50	***Cocktails, drinks*** Chateau le Bas du Gast, Gîte, 6 rue de la Halle au Toiles, Laval (across the street)		
20:00	***Off-site Dining and Bar Experience***		

(Restaurant address: Le Petit Perigord, 63 Grande Rue, Laval; Tel. : 02 43 53 29 43)

session one	session two	session three
Communication & Logic	*Humans*	*Machines*

Saturday May 25th 2009

Morning

Informal Discussion Groups on Science Policy Issues from 8:45am in the auditorium

9:00am Laval Virtual Exhibition -upstairs Salle Polyvalente-

10:20-11:05 Coffee Break –Chateau le Bas du Gast, Gîte, 6 rue de la Halle aux Toiles, Laval (across the street)

11:10-12:00 Auditorium
Plenary Session Chairs: Andrews-Junior KIMBEMBE & Colin SCHMIDT

Topic Stimulator

Professor Viorel GULICIUC

University of Suceava, Romania

"Wisdom of Digital Homo Sapiens. Wisdom as Negotiated Identity"

12:15-**14:15** (proceed together to the « Capucin Gournand »)
Lunch

Afternoon – 2:30pm

	Session I & III Chair: Colin SCHMIDT	Session III, Machines Chair: Colin SCHMIDT
14:30-15:10		**Eliano PESSA** "Quantum Theory of Mind and Human-Machine Interactions"
15:15-15:55	**Jacques LABICHE, Maryvonne HOLZEM, Dominique DIONISI,** University of Rouen ""Heterogenous society" constituted of people and of interactive computerised devices may reveal itself to be very creative"	
16:00-16:40		**P.A. ZIZI,** Padova University "Quantum Cyborgs"

Networking session and Workshop closure

Mergers 2009

is organised by

ParisTech (LAMPA) & Pirstec CNRS

Nous pouvons faire mention ici de deux idées, les « Eclats sociétaux » et les « Enjeux importants ».

Eclats sociétaux.
La différence dans l'intégration de la technologie dans la vie-même est parfois flagrante entre générations.
Un exemple exposé par l'intervenant V. Guliciuc mentionne le phénomène des « digital natives » dans notre jeune population d'aujourd'hui, leurs caractéristiques etc. sans trop insister sur la question « est-ce bien ou pas d'être si numérique ? »
Le but était de dire que l'on a le choix de composer avec ce phénomène (entreprendre des actions positives) ou simplement de rester à le déplorer, le contester. Dès que la société se retrouve face à des questions générées par l'arrivée d'une nouvelle technologie, nous avons toujours le même type de réactions, d'interrogations, de compensations, et les âges se divisent sur les questions, mais c'est toujours une affaire de dégré ou de calcul prospectif. Entre les âges, l'acceptation d'un phénomène est plus, ou moins, une possibilité innée.

Tout les scientifiques présents à cet atelier s'accordent à dire que, grâce aux avancés en Sciences Cognitives (expériementales), en computationalisme, et plus généralement en théories sociales et représentationnelles de l'esprit, les émergences des nouveaux « êtres » dans notre société est possible, voire en cours de réalisation :

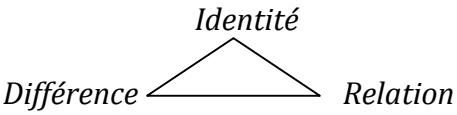
- Robotique intelligente imperceptible = confusion, impostures authentiques
- Intégration d'organes humains dans des machines pour améliorer leur assimilation en société
- artefactualisation de l'homme par l'introduction des éléments artificiels inédits dans le corps (cf. travaux expérimentaux sur des puces de K. Warwick)
- Procréation assisté, avancée ou augmentée en laboroatoire, cloning
- Rôles de mondes virtuels : Réalité virtuelle ou augmentée. Importation d'autrui dans son monde, la « téléportation » de Soi dans un autre lieu ou temps = représentations fausses rendues véridiques

Enjeux importants
Voici quelques enjeux soulévé dans le cadre de notre atelier :

- problèmes d'identité personnelle
- manipulations par avatars imposés
- accelération du mouvement transhumaniste
- Questions de propiété physique et IPR (droits d'auteur, brevets)
- Droits de la personne (modification éventuelle de la définition de la personne)
- Modification de la définition de la machine
- remise en question de la métaphore du « cerveau » dans l'ordinateur et des « comportement machinaux » chez l'homme

Projet de livre collectif. LA CONVERGENCE, De la théorie à la pratique

Le constat général de l'atelier n° 18 était que l'illustration des phénomènes personne(s)-machine(s) est souvent parlante mais la description formelle des mutations chez l'homme ou la machine reste subordonnée à des difficultés de langage. L'outil de rédaction que nous adoptons donc pour bien préciser nos propos dans le cadre de notre co-écriture présente pourrait se visualiser comme suit :



On recours donc au triangle conceptuel de dépendance « Différence|Identité|Relation » pour indiquer l'objectif des descriptions en question pour chaque chapitre. Il s'agit donc d'une prise de position descriptive, utilisant éventuellement les formules suivantes : Distinction de... Adhésion à… Liaison avec...

Un accord a été trouvé avec la maison d'édition Bentham Books pour une double publication papier et E-Book de ces travaux pour l'année 2010.

Les textes suivants ont été sélectionnés et seront retravaillés avec leurs auteurs :

Human Hybridization and the Mediating Effect of Technological Cultures

Lorenzo Magnani

Department of Philosophy and Computational Laboratory, University of Pavia, Pavia, Italy

and lmagnani@unipv.it

Abstract: We are hybrid humans, fruit of a kind of co-evolution of both our brains and the common, scientific, social, and moral knowledge we have produced by ourselves starting from the birth of material culture with our ancestors until the recent effects generated by the whole field of information and communication technologies (ICTs) and of the other technologies. So to say, we are biotechnological hybrid minds. Our minds should not be considered to be located only in the head: human beings have solved their problems of survival and reproduction, "distributing" cognitive and ethical functions to external non-biological sources, props, and aids, which originate cultures and technological cultures. The second part of the paper is related to the analysis of the interplay between cultures and cognition and of some consequences concerning the problem of intercultural communication in the light of the role of moral mediators and docility.

hybriD minds and technological cultures

Following Clark's conclusions on the relationships between humans and technology, especially information and communications technologies (ICTs), we all are "constitutively" natural-born cyborgs – that is, biotechnologically hybrid minds (2003). Less and less are our minds considered to be in our heads: human beings have solved their problems of survival and reproduction by "distributing" cultures and cognitive functions to external non-biological sources, props, aids and technological tools. Our biological brains have delegated to external tools many activities that involve complex planning and elaborate assessments of consequences (p. 5). A simple example might be how the brain, when faced with multiplying large numbers, learns to act in concert with pen and paper, storing part of the process and the results outside itself. The same occurred when Greek geometers discovered new properties and theorems of geometry: they manipulated external diagrams to establish a kind of continuous cognitive negotiation with a suitable external support (like sand or a blackboard), to gain new important information and heuristic suggestions. The use of external tools and artifacts is very common: cognitive skills and performances are so widespread that they become invisible, thus giving birth to something I have called "tacit templates" of behavior that blend "internal" and " external" cognitive aspects (Magnani, 2007, chapter six).

> New technologies will facilitate this process in a new way: on a daily basis, people are linked to non-biological, more-or-less intelligent machines and tools like cell phones, laptops, and medical prosthetics. Consequently, it becomes harder and harder to say where the world stops and the person begins. Clark contends that this line between biological self and technological world has always been flexible and that this fact has to be acknowledged both from the epistemological and the ontological points of view. Thus the study of the new anthropology of hybrid humans becomes important, and I would add that it is also critical for us to delineate and articulate the related ethical issues.

I certainly share Clark's enthusiasm in philosophically acknowledging our status as "cyborgs," but I would like to go further, to do more than just peer through the window of his book at the many cyberartifacts that render human creatures the consumers-cyborgs we are.
Our bodies and our "selves" are materially and cognitively "extended," meshed, that is, with external artifacts and objects, and this fact sets the stage for a variety of new philosophical and moral questions related to the role of *cultures* in our technological world. For example, because so many aspects of human beings are now simulated in or replaced by things in an external environment, new ontologies can be constituted – and Clark would agree with me.
Beyond the supports of paper, telephone, and media, many human interactions are strongly mediated (and potentially recorded) through ICTs, for example the Internet. What about the concept of identity, so connected to the concept of freedom? At present identity has to be considered in a broad sense: the externally stored amount of data, information, images, and texts that concern us as individuals is enormous. This storage of information creates for each person a kind of external "data shadow" that, together with the biological body, forms a "cyborg" of both flesh and electronic data that identifies us or potentially identifies us. I contend that this complex new "information being" depicts new ontologies that in turn involve new moral problems. In turn these new ways of building intercultural relations tend depict uniform behaviors and habits because of the effect of their globalization. We can no longer apply old moral rules and old-fashioned arguments to beings that are at the same time biological (concrete) and virtual, situated in a three-dimensional local space but potentially "globally omnipresent" as information-packets. For instance, where we are located cybernetically is no longer simple to define, and the increase in telepresence technologies will further affect this point. It becomes clear that external, non biological resources contribute to our variable sense of who and what we are and what we can do.

technological Artifacts and intercultural communication

In the light of the considerations illustrated in the previous section we can see every technology (and obviously ICTs, information and communication technologies, which are expressly built to carry information) as strictly intertwined with human beings through a continuous interplay of semiotic activities. In our era of increasing globalization ICT artifacts, like Internet, databases, wireless networks, etc. become crucial mediators of cross-cultural relationships between human beings and communities. I will treat this problem in this and in the following sections dealing with some effects of ICT technologies on the concept of human "docility"and with respect to the properties of what I call moral mediators.
Clark correctly depicts a Nokia mobile phone as something that is "part of us," taken for granted, an object regarded as a kind of "prosthetic limb over which you wield full and flexible control, and on which you eventually come to automatically rely in formulating

and carrying out your daily goals and projects" (Clark, 2003, p. 9). It is well-known that Heidegger distinguished between a tool's or artifact's being "ready-to-hand," like the hammer and the cell phone, and its being "present-at-hand." A ready-to-hand tool does not demand conscious reflection. "We can, in effect, 'see right through it,' concentrating only on the task (nailing the picture to the wall) [or writing a SMS message on a cell phone, we can add]. But, if things start to go wrong, we are still able to focus on the hammer [or on the cell phone], encountering it now as present-at-hand that requires our attention, that is, an object in its own right. We may inspect it, try using it in a new way, swap it for one with a smaller head, and so on" (p. 48). Using a tool becomes a continuous process of engagement, separation, and re-engagement. Just because "ready-to-hand," these tools are called "transparent" or "invisible" technologies.[1] Tools of this type express cultures which we call "implicit".

This brings me to the following point: okay, I also possess a Nec mobile phone and have, consequently, gained a new degree of "cyborgness." I am no longer only intertwined with classic tools like hammers, books, and watches, but I am also "wired" to a cell phone through which I work, I live, and I think. The problem is that our enthusiasm for information and communication technological advances may blind us to the inter-cultural and ethical aspects of the processes of engagement, separation, and re-engagement they make possible.

To heighten my awareness of such processes, I, as I use my cell phone and other tools yet to come, hope to acquire the moral knowledge necessary to maintain and even reinforce my identity, freedom, responsibility, and the ownership of my future; I would hope for the same for all other hybrid humans. I respect the new object or artifact that integrates its cognitive abilities with its users', but we must be mindful of the responsibilities technology brings so that it enhances rather than diminishes us. Moreover, does the cognitive value of the artifact count more than some basic biological cognitive abilities of the human body? What is the dignity of human beings, as special brain/body cultural "materials" with respect to the remaining externalized cultural objects and structures?

Everyone has experienced the difficulty and complexity of unsubscribing from some cyber service suppliers like cell phone companies or Internet providers. Such obstacles testify to the fact that even if they are effective tool-based cognitive extensions of our bodies, they also are tool-based economic institutions aiming to cast themselves as cognitively necessary and irreplaceable things. Because they satisfy market needs, which can be highly aggressive, they in some sense acquire more importance than the biological life itself.

As I have illustrated above, new technological artifacts become "ready-to-hand," but at what ethical and cultural cost? We must still be able to extricate, if we so choose, the technology that has appeared into our lives. Terminating a cell phone service contract, for example, should be an easy process without extended hassles or unexpected costs. What way of ethical thinking fully explicates that right and will lead to new policies and laws that will protect human dignity in the future technological world? What "countercultural" strategies and cognitions I need if a sophisticated new neurophone (Clark, 2003, chapter one) is wired into my cochlear nerve as a direct electronic channel? Or how will one get rid of an "affective wearable" that monitors your stress levels and provides daily profiles and other data to you, but in the meantime is generating an intolerable information overload? (Picard, 1997, p. 236). You start to think you have another "self," and it feels as if you no longer own some of the information about yourself – that damn affective wearable also monitors all your frustrations and shows you an interpretive narrative on how things went. It is not simple to have the maturity necessary to deal with a kind of another "self", fruit of

[1] Weiser, 1991. On the so-called "invisible technologies" see Norman, 1999.

technology, that monitors and tells us another story about us. And certainly, scientific advances like the neurophone Clark describes and the "affective wearable" "will come first, and only later on the moral and legal rules." As I will better illustrate in the following section, the production of an appropriate counterculture is central to avoid the blindness to the dangerous ethical consequences of ICTs and other technologies.

There is a profound tension between the biological and the cultures engendered by technological spheres of human hybrids, who are composed of a body plus cell phone, laptop, or the Internet, etc. Sometimes the two aspects can be reconciled by adjusting and redistributing various new cultural and ethical values, but the struggle is ongoing and the final results are unknowable: the outcome simply depends on the moral targets hybrid people identify and advocate. Do the cultural functions spontaneously engendered by a the cell phone count more than some preexistent cultural values related to the biological body "without" that artifacts, or "with" other old-fashioned artifacts? Is the new delegation of tasks to the cell phone, and the consequent cultural modifications, really compensated by new positive capabilities and chances, or does a biological body's lack of cognitive autonomy become intolerable at some point?

In my book (Magnani, 2007) I describe in details how the economic value of technological objects that are "grafted" onto human beings makes it dangerously easy to produces cultures where people are treated people as means, and it is well-known that the market economy is inherently inclined to regard human beings this way. In a market economy, qualities and worth of human beings – their intelligence, energies, work, and emotions, etc. – can be "arbitrarily" exploited and/or disregarded in favor of solely promoting the sales of artifacts, items which may or may not be that useful. Situations like these, of course, inevitably generate frustration. Central to this issue is the fact that many people are used to being considered things: they are, in Kantian terms, "treated as means (and only as means)." In the book I offer a way to recalibrate the cultural and ethical value of things so that "respecting people as things" becomes a positive way to regard them.

To give an example, one day it may happen that people, after having lost in the potential new cultures engendered by technology a great part of their biological cognitive qualifications because of their technological alienation of them would yearn to be as respected as a cell phone – perhaps the expensive one of the future that I mentioned before, the direct electronic channel wired into my cochlear nerve that features a sophisticated processor with spectacular AI tools and a direct Internet connection. In that cultural framework, the hybrid person at hand will feel herself dispossessed of the moral cognitive worth already attributed to nonbiological artifacts. It is very simple to imagine how this situation will be much more complicated by the appearance of future super-cyborgs endowed with huge extra memory, enhanced mathematical skills, extrasensory devices, and – why not - able to communicate "by thought" various signals. They will be more powerful than humans, with brain that are directly part human and part machine, so as the "epicentre of moral and ethical decision making will no longer be of purely human form, but rather it is a mixed human, machine base" (Warwick, 2003, p. 136).

Being cared for and valued is not always considered a human right, for instance collectives do not have moral (and legal) rules that mandate the protection and preservation of human beings' cognitive skill. As a result, we face a paradoxical situation that inverts Kant's thinking, one involving people who are not "sufficiently" or appropriately treated as means, as things. Yet people's biological cognitive skills deserve to be valued at least as much as a cell phone: human cognitive capacities warrant moral credit because it is thanks to them that things like cell phones were invented and built to begin with. In this way, human hybrids can reclaim "moral" recognition for being biological carriers of information, knowledge, know-how, autonomy, cultural traditions, etc., and gain the respect given to cognitive artifacts for being external cultural repositories: books, for example, PCs, or works of art. That human hybrid, who exhibits

knowledge and capacity to reason and work, will expect to play a clear, autonomous, and morally recognized role at the level of his/her biological intellectual capacities.
What I have just illustrated will hold also in the case of the future super-cyborgs I depicted above, fruit of the most advanced ICTs revolution, just with slight modifications. Two moral problems will still be at stake: 1) the problem of the "equal" distribution among human beings/brains of those sophisticated artificial endowments like extrasensory devices;[2] 2) the fact that super-cyborgs possess biotechnological cognitive skills deserves to be valued in a very balanced way: super cyborgs' "biological" cognitive capacities will have to be valued very much, not to consent the priority and the dominance of the artificial aspects, so determining cyborgs with intelligent prostheses but dull brains.

Technological Cultures and countercultures and the role of docility:

I contend that technological cultures are formed through semiotic anchorage of informational content to external material objects and structures. I have described this process as a kind of disembodiment of mind in my (Magnani, 2006). I also think the disembodiment of mind can nicely account for semiotic processes of creation of countercultures.

Moral Mediators and Technological Cultures

I maintain that cultural representations are external and internal. We can say that
- *external cultural representations* are formed by external cultural materials that express (through reification) concepts and problems that are not necessarily present in the brain of some human beings;
- *internalized cultural representations* are internal re-projections, a kind of recapitulations, (learning) of external representations in terms of neural patterns of activation in the brain. It is in this way that human beings take part in a culture or in a new culture. The representations can sometimes be "internally" manipulated like external objects and can originate new internal reconstructed representations through the neural activity of *transformation* and *integration*. It is at this level that a "countercultural" effect can be activated. When the fixation of external [new] cultural units - derived from the interplay between the two levels - is reached, they can be in turn externalized to the aim of constituting new cultural devices open to a further possible diffusion.
In our technological world there is a huge expansion of private and public "objects" and "artifacts" that have gained a great importance in everyday life and for the self-definition of people, especially in industrialized societies. The global trade and the continuous exchange of commodities is one of the central aspects of our lives in the cyberage. Regional and national products have become available worldwide, and some of them have become international commodities, marketed and consumed globally.

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[2] It is evident that already current human brains are provided in various degrees with external "natural" (teachers, parents, other human beings, etc.) and artificial cognitive mediators (books, schools, laptops, Internet access, etc.), because of biological differences and social inequalities. For more information about cognitive delegations to organizations, institutions, etc., see Perkins (2003).

I have illustrated how these artifacts play the role of "cultural mediators". Let us now describe some details of this effect of mediation, paying special attention to some ethical consequences. All technological artifacts embed a fragment of cultural knowledge and experience, and are the fruit of complicated cognitive delegations. These delegations explain, in the case above of the cell phone – explicitly related to ICTs – but also in the case of furniture or food, why artifacts can influence many communicative processes.
Roth (2001, p. 567) illustrates some important cultural roles played by artifacts. Artifacts can be: 1) topics or themes of (intercultural) communication, which carries internationally the know-how about products; 2) material contexts that "wrap" each act of communication; 3) media for intercultural communication; 4) transferred and communicated across cultural boundaries, as merchandise; 5) entertainers of various relationships with humans, related to the available culture specificity; 6) used symbolically; 7) ways of overcoming the difficulties in interpreting foreign cultures.
Furthemore, artifacts (included the less technologically structured) play a *spatial* role in separating public and private spaces, workplaces, etc., like in the case of buildings and streets, chairs and table in houses and offices; they also have a *personal* dimension at the *communication* level, like in the case of clothes, utensils, ritual objects, fences, etc., and an *actional* dimension, in eating, working, celebrating, etc. These dimensions are usually related to standard roles the artifacts play, and only special interactions with humans can change these default characters. In the case of globalized artifacts it is through the cyclic process of internalization/externalization described above that they can culturally acquire new ethnic, regional, or national ethical values and new identifications and meanings (Teuteberg, Neumann, and Wierlacher, 1997), in a process which sometimes is clearly characterized by a *countercultural* disposition, that can arise both at cognitive and emotional level (Lindner, 1997). In EU the controversies about Italian pasta, Dutch clogs, French champagne and German beer have demonstrated "the extent to which regional and national identities are tied to material cultures and local cultures are used as countercultures to globalization" (Roth, 2002, p. 573).
The insistence on the home country artifacts in the case of the emigrants demonstrates how values of objects can acquire new meanings and change their disposition once removed from their standard places; in other cases foreign objects and artifacts are often responsible of a kind of culture shock. The so-called countercultural effects of *creolization* (Howes, 1996) and *localization* (Lindner, 1997, Roth, 2002, p. 571) have affected the international cultural identity of goods like Coca-Cola, that certainly represents the symbol of globalization of products.
Similarly, in the case of new media and technical instruments which work at the level of worldwide transmission of information and/or at the level of global communicative networks, there is evidence (Bredin, 1996) that in their use (but also in the use of technological equipments like cell phones and laptops) there are significant cultural differences. In some cases the transfer of technology might not appreciate local values and it might also later on undermine those values (Moss, 2005), so that a great part of the globe, as well as the majority of the world population, do not enjoy the fruits and benefits that information technologies are supposed to bring (Hongladarom, 2005). In other cases, some positive impacts have been experienced.
In this domain of the complex interaction between technological cultures and intercultural communication the literature of the so called Social Construction of Technology (SCOT) is also relevant (cf. Sismondo, 1993 and Winner, 1993). It is in this area od studied that Latour's notions of the de-humanizing effect of technologies emerge and are based on the so-called "actor network theory."[3] The actor network theory basically maintains that we should think of science, technology, and society as a field of

[3] This theory has been proposed by Callon, Latour himself, and Law (cf. Callon, 1994, 1997, Latour, 1987, 1988, Callon and Latour, 1992, and Law, 1993).

human and non-human (material) agency. Human and non-human agents are associated with one another in networks, and they evolve together within these networks. Because the two aspects are equally important, neither can be reduced to the other: "An actor network is simultaneously an actor whose activity is networking heterogeneous elements and a network that is able to redefine and transform what is it made of […]. The actor network is reducible neither to an actor alone nor to a network."
A different but related perspective – one that, like Latour's, avoids anthropomorphic prioritization of human agency and addresses the dissolution of boundaries between things and people – is offered by Andrew Pickering in his writing on science-studies of post-humanism. He describes externalities (representations, artifacts, tools, etc.) as kinds of non-human agencies that interact with a decentered human agency in a dialectic of "resistance" and "accommodation" called *the mangle of practice.*[4] The resistance is a failure to capture material agency in an intended form, while accommodation amounts to a reconfiguration of the apparatus that might find a way through its resistance. When human-and non-human agencies are brought together, as has often occurred in mathematics, natural sciences and technology throughout history, it is impossible to predict the results.
An example of a positive impact and of reinvention of roles of western technology in a developing country is given by the substantial role played by cell phones in ensuring, in the Republic of the Philippines, the success of the EDSA II people power revolution in 2001, which forced President Joseph Estrada to resign (Valdez, 2005). In this case technology was effectively used by civil society in raising new cultural consciousness of the Filipino people. During the height of the impeachment trial against president Estrada the total volume of the SMS text messages exchanged by Filipinos in a single day exceeded the total volume of text messages in the whole Europe. A similar event is of course unconceivable in western countries.
Another example of cross-cultural positive employment of technology is given by young women's exploitation of Internet booths in Indian villages to the aim of improving not only information and education but also effective economical growth in rural transformation. Internet booths played a fundamental role in making those women able to overcome their personal and cultural borders.
In my book *Morality in a Tecnological World* (Magnani, 2007) I have introduced the concept of *moral mediator*. A moral mediator is a cultural mediator where ethical aspects are crucial and the importance in potential intercultural relationships is central. What exactly is a moral mediator? Morality, is often performed in a tacit way, so to say, "through doing". Moreover, part of this "doing" can be seen as an activity of cultural manipulation of the external word for just building "moral mediators". They can be built in the aim of getting ethical effects, but they also consist in beings, entities, objects, structures, that objectively, beyond the human beings' intentionality, carry ethical or unethical consequences. Hence, a significant portion of manipulations is also devoted to building that vast new source of distributed information and knowledge that originates external moral mediators.
Moral mediators represent a kind of *redistribution* of the moral effort through managing objects and information in such a way that we can overcome the poverty and the unsatisfactory character of the moral options immediately represented or found internally (for example principles, prototypes, etc.). I also think that the analysis of moral mediators can help accounting for the mechanisms of the macroscopic and growing phenomenon of global moral actions and collective responsibilities resulting from the "invisible hand" of systemic interactions among several cultural agents at local level (Floridi and Sanders, 2003). A cultural object, like an Internet web page where some commodities are sold online, not only realizes an economical transaction but also

[4] Cit., p. 17 and pp. 22-23.

carries ethical effects in so far as it implies certain customer's behaviors related to some policies and contraints.
Natural phenomena can also serve as external artifactual moral mediators: many external "natural" objects, animals for example, create opportunities for new ethical knowledge, as in the case of endangered species. Thanks to utilitarianism and environmentalism some animals have acquired the moral definition of "endangered": in turn people learnt something new by discovering – through those animals as moral mediators - how also human beings can be redefined as "endangered". Many external things that have been traditionally considered morally inert can be transformed into moral mediators. In general, we can use animals to identify previously unrecognized moral features of human beings or other living creatures, as we can do with the earth, or (non natural) cultural entities; we can also use cultural external "tools" like writing, narrative, ritual, and various kinds of pertinent institutions to reconfigure unsatisfactory social orders. Hence, not all moral tools are inside the head – many are shared and distributed in external objects and structures that function as ethical devices.
External moral mediators function as components of a memory system that crosses the boundary between person and environment. For example, they are able to transform the tasks involved in simple manipulations that promote in an agent further moral inferences. When an abused child is moved to a house to reconfigure her social relationships this new moral mediator can help her to experience new inferences (for instance new emotions concerning adults and new imageries about her past abuse). Moreover, I can alter my bodily experience of pain through action by following the template *control of sense data*, as we previously outlined, that is through shifting – unconsciously – the position of my body and changing its relationships with other humans and non-humans experiencing distress. Mother Theresa's personal moral rich feeling and consideration of pain had been certainly shaped by her closeness to starving and miserable people and by her manipulation of their bodies. In many people, moral training is often related to these kinds of spontaneous (and "lucky") manipulations of their own bodies and sense data so that they build morality immediately and non-reflectively "through doing." It is obvious that these processes involve a cultural (often countercultural) redefinition of the role of bodies with respect to the received perspectives.
What is the suggestion we can get from the concept of moral mediator with respect to the problem of intercultural communication? I think that the main teaching regards the need to understand the "language of objects" of other cultures. Given the huge cognitive and emotional role played by things and external representations, it is through them we can increase the effects of commensurability even in the hardest cases of conflicting cultures. Let us illustrate the example of Islamic fundamentalists and Western capitalist culture, where a counterculture is activated, to the aim of reinterpreting capitalistic rules, transactions, and loans.
Islamic fundamentalists have resumed medieval objections to the charging of financial interest as part of a more extended attack on Western influences, and look for different ways of financing commerce and industry that in their eyes do less violence to Islamic society and countries. They consider international loans from Western governments and banks as basically exploitive, but expect to find and retain elements of capitalism within their domestic economies as tools for promoting development within the family: "So the medieval debate about the clever new forms of contract, aimed at circumventing the moral objection to interest, is being repeated in contemporary Islam, in the hope of squaring the needs of commerce with the traditional injunctions of the *Sharĩ ya*"(Jonsen and Toulmin, 1988, p. 310).
Here we see that using an old financial practice in a new context (modern Islam) generates problems; difficulties arise when international loans are made between countries with different cultures. The medieval conflict between "moral" investing and immoral money lending acquires new relevance. Simply applying a general principle

against usury is not particularly productive, for it limits opportunities for commerce between Muslim nations and the rest of the world; instead, new ways of conducting business must be considered able to act as moral mediators of the puzzling situation. The underlying lesson here is that the concrete case – the seemingly irreconcilable conflict between cultures – takes agents beyond the reach of rules and compels them to take into account a particular set of circumstances – the fact that there are other commercial practices that are acceptable in Islamic business communities. In other cultural cases, similar situations can be found, when some abstract principles are not always universally "good" principles to use when deciding how (and whether) to treat particular cases, because their application can be techniques that can often be very useful but can have unacceptable negative side effects for both the children and their families. In the usury problem abstract rules must be suitably modified and mediated to fit particular circumstances.

Externalization of Cultures in Docile Humans

Following Simon's perspective, human beings first of all always and constitutively operate in a situation of "bounded rationality": human beings and other creatures do not behave optimally for their fitness, because they are not able to get knowledge and making inferences which would support optimization. Moreover, in order to survive, humans are "docile", in the sense that our fitness is enhanced by "*the tendency to depend on suggestions, recommendations, persuasion, and information obtained through social channels as a major basis for choice*" (Simon 1993, p. 156). In other words, we support our limited decision-making capabilities counting on external data obtained through the senses, from the social environment. The social context gives us the main data filter, available to increase individual fitness (Secchi, 2006).

The concept of "docility" is related to that of altruism, in the sense that one cannot be altruistic if s/he is not docile. In this perspective the intelligent altruist is the fittest. However, the most important element seems to be docility more than altruism, because docility is the condition of possibility of the emergence of altruism. In Simon's work docility is also related to the idea of "socializability", and certainly it is an aspect of both the human beings' continuous cognitive delegations to the external environment and to other social members.

The problem here is twofold. First, people delegate data acquisition to their experience and to the external cultural resources and individuals, as I have illustrated in the first three sections of this paper. Second, people do trust others to learn. I have illustrated above how a big cortex, speech, rudimentary social settings, and primitive material culture furnished the conditions for the birth of the mind as a universal machine. I contended that a big cortex can provide an evolutionary advantage only in presence of a massive storage of meaningful information and knowledge on external supports that only an already developed small community of human beings can possess. If we consider high-level consciousness as related to a high-level organization of human cortex, its origins can be related to the active role of environmental, social, linguistic, and cultural aspects. It is in this sense that "docile" interaction lays on the very basis of our social (and neurological) development.

It is obvious that docility is related to the development of cultures, their availability, and to the quality of cross-cultural relationships. Of course the type of dissemination of cultures and their possible enhancement affect the chances human collectives have to exploit docility and so to increase their fitness. I guess the conflicts and lacks of dialogue between cultures, and the excessive normalization generated by globalization, can diminish the positive effects of docility. I strongly think research on these and similar aspects have to be established and encouraged.

Conclusion

I think the role of what I call "cultural mediators" can be further studied also taking advantage of the research on the interplay between technological cultures and distributed cognition and appropriately stressing the problem of the co-evolution between brains and cultures. The final part of the paper aims at offering new suggestions related to the analysis of the interplay between technological cultures and cognition and of some consequences concerning the problem of intercultural communication in the light of the role of "moral mediators" and docility, with respect to the effects of ICTs. I think that because of the relationship between docility and culture, further research has to be promoted on the chances human collectives have to exploit docility and thus to increase their fitness, with respect to the role of intercultural communication.

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WISDOM OF DIGITAL HOMO SAPIENS. WISDOM AS NEGOTIATED IDENTITY

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Abstract

Anyone could observe the huge debate nowadays on the influences of the digital on the education. Example: Marc Prensky's concepts («digital natives»/«digital immigrants», «digital multiplier», «digital wisdom» etc.), were followed by sharp reactions (ex.: Timothy VanSlyke), confessing, different approaches of the identity of the being (Human Being) under education, finally.

In the *Academe*, technology has to be studied as one of the essential modes of being human. We have to guide our students to be *digitally wise* and to attain *digital wisdom*.

There is a real multiplication of the dimensions of the human being, when Singularity is more and more near. We deal with a whole set of different identities [plural (?), multiple (?), alternative (?), concurrent (?), divergent (?), virtualising (?)]. Yet we are more and more often discussing about the process of merging of humans with their machines. Because there are several different perspectives on the merging process, we have to manage a scale of merging, as we may have to manage a scale of wisdom

and the problem of a specific form of the wisdom of the *homo sapiens digital.*

In our society, we have just passed from individual having a dominant identity, crashing its recessive identities, his "shadow(ed) identities, toward a constellation of concurrent and sometimes alternatives identities, engaged in a permanent negotiation, that could, may be the sign of the wisdom appropriate for our Digital Era. From human wisdom, we have passed toward digital human wisdom / human digital wisdom - a symbiotic, non-generic and un-unitary wisdom.

The merging process analysis engages the search for the identity and a discussion on the identity/sameness relationship and leads us

from „no entity without identity" to „no identity without a process", because in the Digital Era, our identities are negotiated.

Keywords: wisdom, digital wisdom, homo sapiens digital, identity, merging of humans and machines

PRETEXT OF THE DISCUSSION: IDENTITY OF THE HUMAN BEING AS SUBJECT OF EDUCATION

In *the age of spiritual machines*, we have to deal with the Idea of an inexorable process of humans and machines merging.

William Nelson Joy[5] confessed**,** in ***Wired Magazine***, in the very first lines of his highly quoted paper **Why the future doesn't need us:** *"From the moment I became involved in the creation of new technologies, their ethical dimensions have concerned me, but it was only in the autumn of 1998 that I became anxiously aware of how great are the dangers facing us in the 21st century. I can date the onset of my unease to the day I met Ray Kurzweil, the deservedly famous inventor of the first reading machine for the blind and many other amazing things. Ray and I were both speakers at George Gilder's Telecosm conference, and I encountered him by chance in the bar of the hotel after both our sessions were over. I was sitting with John Searle, a Berkeley philosopher who studies consciousness. While we were talking, Ray approached and a conversation began, the subject of which haunts me to this day."*
Something essential is happening when approaching to Singularity.
Our **thesis** is that we are experiencing the passage from *the understanding of [human] identity as status* to *the understanding of the [human] identity as process*.
Experiencing the embodiment *of* the artefacts and the embodiment *into* the artefacts, the dimensions of being human are changing as we are passing from *humonism* to *symbionism.*
In the same time, we are also passing from *human wisdom* to *digital human wisdom / human digital wisdom*, toward a symbiotic, non-generic and un-unitary wisdom.

WISDOM AND DIGITAL HOMO SAPIENS

The young human beings having to be educated nowadays are different, from those only from a quart of century ago, because our Digital Native student has a special relationship with his machines/tools.
These Human Beings became Digital Human Beings.

On September 19, 2008, Marc Prensky[6] used a series of four questions to challenge the audience, participating to the 25th Anniversary Celebration of NJECC:*Are today's students different? What should our students know? How should we teach them? Is technology in class a help or a curse?*[7]
The challenge worked, not only because its concepts have already a history behind them, but because they are engaging a deeper discussion, on the identity of the human being's identity in our society.
The simplest enumeration of the concepts he introduced / promoted in the last decade will consider: *digital natives / digital immigrants*[8]; *herding*[9]; *digital multipliers*[10]; *21st Century Skills*[11]; *digital wisdom*[12].

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[5] See: http://www.wired.com/wired/archive/8.04/joy_pr.html
[6] **Writings,** accessible starting from: http://www.marcprensky.com/writing/
[7] **21st Century Learning Initiative**, at: http://thumannresources.com/tag/21stcenturyskills
[8] **Digital Natives, Digital Immigrants,** In: *On the Horizon* (MCB University Press), vol. 9, no. 5, Oct. 2001; **Digital Natives, Digital Immigrants. *Part II:* Do They Really *Think* Differently?** In: *On the Horizon* (MCB University Press), vol. 9, no. 6, Dec. 2001.
[9] **Listen to the Natives,** In: *Learning in the Digital Age*, Dec. 2005, vol. 63, no 4, pp 8-13.
[10] **Let's Be "Digital Multipliers". Eliminating the Digital Divide Is Something Educators Can Do,**accessible at: http://www.innovateonline.info/index.php?view=article&id=705&action=article; In: *Educational Technology*, Jan-Feb 2009.

We could try to resume *grosso modo* his ideas as it follows. Our students "are no longer the people our educational system was designed to teach"[13]. Our "schools are stuck in the 20th century", meanwhile „students have rushed into the 21st". So, the following issue arises: „How can schools catch up and provide students with a relevant education?" This is why "we must find alternatives to our primary method of education organization" called by Prensky *herding*. The "teacherds" have to become teachers. "Today's students *think and process information fundamentally differently* from their predecessors (Prensky is using the observations and conclusions of Dr. Bruce D. Perry of Baylor College of Medicine): "Different kinds of experiences lead to different brain structures", "it is very likely that *our students' brains have physically changed* – and are different from ours – as a result of how they grew up. But whether or not this is *literally* true, we can say with certainty that their *thinking patterns* have changed". The education's problem now is that "our Digital Immigrant (DI) instructors, who speak an outdated language (that of the pre-digital age), are struggling to teach a population that speaks an entirely new language". Distinct of the DI *Digital Natives (DN)* "are used to receiving information really fast"; "like to parallel process and multi-task"; "prefer their graphics before their text rather than the opposite"; "prefer random access (like hypertext)"; "function best when networked"; "thrive on instant gratification and frequent rewards"; "prefer games to "serious" work". *Digital Immigrants:* "have very little appreciation for these new skills that the Natives have acquired and perfected through years of interaction and practice". "These skills are almost totally foreign to the Immigrants, who themselves learned – and so choose to teach – slowly, step-by-step, one thing at a time, individually, and above all, seriously". "Digital Immigrants don't believe their students can learn successfully while watching TV or listening to music, because they (the Immigrants) can't". "Digital Immigrants think learning can't (or shouldn't) be fun."[14]

Prensky believes „the single skill that will, above all others, distinguish a literate person is programming literacy, the ability to make digital technology do whatever, within the possible, one wants it to do – to bend digital technology to one's needs, purposes, and will, just as in the present we bend words and images. Some call this skill human-machine interaction; some call it procedural literacy. Others just call it programming"[15].

He notes: "if we (and our students) are willing to be creative, I see no reason why there should be a digital divide at all anywhere". "I suggest we begin thinking of ourselves as "digital multipliers" – i.e. people who find creative solutions that bring every student, no matter what his or her background on income level, into the digital world – and get the job done".[16]

From this perspective, in a technological world, we have to re-invent wisdom, around the digital wisdom.

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[11] **Marc Prensky's Essential 21st Century Skills**: http://www.marcprensky.com/writing/Prensky-Essential_21stCenturySkills.pdf

[12] **H. Sapiens Digital: From Digital Immigrants and Digital Natives to Digital Wisdom**, accessible starting from: http://www.innovateonline.info/index.php?view=article&id=705&action=article; In: *Journal of online education*, vol. 3, no 3 Feb./March 2009.

[13] **Digital Natives, Digital Immigrants,** In: *On the Horizon* (MCB Univ. Press), vol. 9, no. 5, Oct. 2001

[14] **Listen to the Natives,** *loc.cit.*

[15] **Programming: The New Literacy.** In: *EDUTOPIA Magazine*, Feb. 2008.

[16] **Let's Be "Digital Multipliers". Eliminating the Digital Divide Is Something Educators Can Do,** In: *Educational Technology*, Jan-Feb 2009.

As Mircea Eliade observed, we can explore and assume, experience Being, the fact-of-being, in several very different and irreducible ways: as a scientist searching for truth, as an aesthete searching for beauty, as a moral person searching for the good, as a philosopher searching for essence, or as religious people searching for the sacred. We understood, in the last decades, that we could interface, experience Being in very various new fundamental ways, as engineers - searching for the design and expansion of human order, or as digital natives, searching the *digital wisdom* in order to become *homo sapiens digital*.[17]
We have to guide our students to be *digitally wise* and to attain *digital wisdom* in such an intimate way as to be able to use the technology and its Digital Tools as an essential part of being human – and so naturally, that as Digital Natives they will not even be aware of it[18].

However, the problem of the wisdom in the Digital Age could have another, more radical sense, too, because directly related to the special identity of the human merged with the machine.

DIMENSIONS OF mERGERs

In various dictionaries, we will find that ***to merge*** means**:** t**o** combine (be combined) / to join together into a whole / to cause things to do this and that ***the result of the merging*** of two entities, into one is called ***merger***.
A synopsis of the "merge" senses will retain:

Merging as combation:

Merging as…	*Synonyms: to…*	Human & machine (H&M)
collision		H&M collide
interpenetration	mix or *merge* together	H&M merge
amalgamation	combine, *merge*, unite, integrate, fuse, blend, mingle, intermingle, mix, intermix, incorporate	H&M amalgamate
band	join, group, unite, *merge*, combine, team up, gather, ally, affiliate, associate, federate, consolidate	H&M band
blending	mix, combine, admix, mingling, commingling, amalgamate, unite, *merge,* compound, alloy, fuse, compose, homogenize	H&M blend
mingling	mix, blend, combine, compound, homogenize, *merge,* unite, join, amalgamate, fuse	H&M are mingling
composing		H&M compose
mix		H&M are mixin
condensation	lose separate identities and *merge* into a single entity	H&M condensa
convergence	meet, join, *merge*, unite, come together, become one, coincide, concur	H&M converge
homogenization	make uniform, combine, coalesce, fuse, *merge*, blend, emulsify	H&M

[17] Marc Prensky, **H. Sapiens Digital: From Digital Immigrants and Digital Natives to Digital Wisdom**, In: *Journal of online education*, vol. 3, no 3 February/March 2009, URL: http://thumannresources.com/tag/21stcenturyskills.
[18] Marc Prensky, **H. Sapiens Digital,** *loc. cit.*

		homogenize
uniformization		H&M reach a unique form

Merging as collaboration:

Merging as…	*Synonyms: to…*	Human & machine (H&M)
cooperation	working or act together	H&M cooperat
symbiosis	*live together of organisms of different species*	

Merging as integration:

Merging as…	*Synonyms: to…*	Human & machine (H&M)
concatenation		
assimilation	*merge* or "blend," individuals from one cultural group into a second group	H assimilated by M M assimilated by H
incorporation		
integration		

Merging as melding:

Merging as	*Synonyms: to…*	Human & machine (H&M)
melding	join, blend, combine or *merge* things into one	H&M meld
coalescing	unite, join together, combine, *merge*, amalgamate, integrate, affiliate, blend, fuse	H&M coalesce

Merging as becoming one:

Merging as	*Synonyms: to…*	Human & machine (H&M)
becoming one		H merge into M M merge into H
unity		
unification	unite, bring together, *merge*, fuse, amalgamate, coalesce, combine, blend, mix, bind, link up, consolidate.	H&M are unifying
synthesis	combine, unite, unificate, *merge*, amalgame, fuse, coalesc, integrate	

The synonymy is a mechanism for introducing a well indexed multiplicity, as it confesses *several different perspectives on the merging process* - in the above synopsis: *merging as combining, collaborating, integrating, melding and, finally, becoming one.*

Yet, *those various perspectives on merging,* are suggesting the exsietence of *various degrees of merging.*

That is why we have to formulate the idea that, in fact, *we have to manage a scale of merging* or even *a whole table of Mendeleev for merging.*
Humans and machines merge. Considering this reality from those different *degrees and forms of merging*, only in some cases the *merging as cooperation or, better, symbiosis* seems to be more appealing[19]:
In the case of *cooperation*, we have to expand the possible cases with the *cooperation of humans and machines* (not enough clearly included as possible, in the current definitions) and to consider *the voluntary or even* unintentional *human cooperation with machines*, but not the coerced (forced) cooperation.
In the case of *symbiosis*, we have to include among the possible cases the collaboration of living beings with non living beings, continuing and expanding the idea of the *symbiogenesis* (= symbiosis is a major driving force behind evolution) of Lynn Margulis. *Ad limitum,* symbiosis as *mutualism (and not as parasitism or even helotism)* will lead us toward the idea that the complex living systems (as we may could consider the merger of humans and machines) could also illustrate that *"life did not take over the globe by combat, but by networking"* (Lynn Margulis and Dorion Sagan).
Those observations are enforcing us to be more aware about the merging as process.

Yet, a merging process could be complete or not, total or partial.
Thirdly, in order to have a merging process, there have to be some common characteristics of the beings and/or things collaborating in it. Humans and machines merging should favor those humans having different characteristics from those of them living during, let's say, the beginning of the 20th century.
Here, we meet again Marc Prensky, who suggested among the *essential 21st century skills*: *knowing the right thing to do; getting it done; doing it with others; doing it creatively; constantly doing it better*[20].
Let us observe and agree that some of those skills are characteristics of the intelligent machines, too.
From this perspective the merging of humans and machines is a *natural process.*
However, is / will be the human identity preserved, is it / will be lost in the merging process?

IDENTITY *VERSUS* IDENTITIES FOR DIGITAL HUMAN BEING?

Identity can be explored from several perspectives: philosophic (metaphysic), mathematic, logic, genetic, legal, psychologic a.s.o. because the common, natural use of the notion of identity is a real polysemic one[21].
The Latin etymology of *identitas* is from *id* and *ens* (= a pronoun and a noun) that, as notion, describes the *essence* (*ens* = what is in itself and what it shows as being)[22].

[19] If "appealing" is the term that should be used here.
[20] See: **21st Century Learning Initiative**, at URL: http://thumannresources.com/tag/21stcenturyskills
[21] Because of the various perspectives deployed starting from the basic link between identity and quantification, here, the accent is not on the logic of identity, on the principle of the indiscernibility of the identical, on the absolute or relative identity, on the criteria of identity, on the identity over time, on the identity across multiple worlds, on the contingent identity or on the vague identity.

Identity is, commonly considered as whatever makes an entity definable and recognizable, as the possession of a set of qualities or characteristics that distinguish that entity from other entities. In philosophy, we are used to call/to consider *identity* as *sameness*. However, let us observe that *sameness* only corresponds to *the numerical identity*[23], which can be hold between an entity and itself. In the case of a *qualitative identity,* there is about the common character of two objects of our thought, distinct in space and time, but sharing the same qualities and why the entities can be more or less qualitatively identical[24].
Considering the link between the identity and the nature (of something) it is difficult to say, with Harold Noonan, that *the meanings of „identity" and "sameness" are identical.* (SEP) and immediately after that to observe they have more than one meaning, if accepting synonymy as a complexity generating machine (as we saw in the exploration of the meanings of "merge").
It is not oriented toward the surface of an entity or a process but toward its content, its essence (if it is to use an old style of referring to it). This is the inner, the *ipse* side of the identity.
From this perspective, the different identities of the digital natives and machines, that are sharing some common characteristic, are permissive to the process of the merger creation as a sort of half symbiosis half synthesis of the humans and machines.
Yet, the identity of an entity exists from its very beginning, as *power to become the same* when *becoming* in the future. It is linked to *the power of being*, considered by Aristotle who observed, for the first time, that *no being could be (exist) without the power of being, because every past time is already a future.*

Even Sir William Hamilton had right to observe that "identity is a relation between our cognitions *of* things*,* not *between* things themselves*",* the merging process of Humans and Machines, implies the physical melding of the Humans with Machines which makes relative their nature (identity). So, considering identity as "nature", as "defining characteristics" etc. we have to admit the capital importance of the physical process itself, because our ground intentionality is always confessing something essential about the world (as it challenges the problem of referentiality). That is why Colin T.A. Schmidt observes "What percentage of human does one need embedded in oneself in order to be considered human?[25]
The relative identity (nature) of the entities are leading our analysis toward the relativism of the values itself. Or that is deeply related to what we commonly call "wisdom".

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[22] The ancient Greek term *evlos,* is also designating what is inside, in the inner space, in the content of something.
[23] The link relating identity and quantification seems to be not very interesting in a discussion focused on the merging process of (Digital) Human Being and Machine. That is why it will be not really followed here.
[24] For some authors (Frege, Lewis), identity is not a problematic notion *"for it is just that relation everything has to itself and nothing else – and what could be less problematic than that",* while for others it is *"since it is difficult to see how a thinker could have the conceptual resources with which to explain the concept of identity whilst lacking that concept itself."* (SEP)
[25] **Having Difficulty with Identity**, in ***Teori***a, no 2/2007, p. 81 Se also the questions he is fpcussing on: "1. Are or can Humanoid Robots in quest of *our* Selfhood? 2. Should we define an artificial version of Selfhood? 3. How are we to react towards the Other if unsure of the nature of that Other? 4. Are we ready to lend our full human status to (partially) non-human objects? 5. Is it worth members of human society losing some of their status in order to further the automation of human intellect and embodiment?" (pp. 81-82)

The multiplication of the dimensions, horizons and levels of the human being today requires a better management of the complexity of our identities and *a table of Mendeleev for the those identities*.
Managing these plural / multiple / alternative / concurrent / divergent etc. identities lead us toward the problem of the wisdom in the Digital Era, as we have many identities, sometimes concurrent: we are those multicell organisms participating in this conference, we also are the owners of some bank accounts, lands, building, cars etc., we are the sets of data associated with an/some online ID(S), we are the avatars from the Second Life, we are the collection of social roles in our cities or workplaces, we are our dreams and/or our sexuality etc[26]. Let's remember: *"Digital wisdom means not just manipulating technology easily or even creatively; it means making wiser decisions because one is enhanced by technology."*[27]

The Digital Natives have a natural, increased capacity to manage complex sets of identities, without loose the coherence of their identity. Its natural capacity to manipulate in a multitasking way, multiple set of data, changing / switching permanently and continuously its various virtual identities seems to favor / to privilege the capacity of the human being to have a mutualist symbiotic relation with the machine and not necessarily t be integrated into a machine (or Singularity). Moreover, they seem to be naturally adapted to manage multiple simultaneous changes in the very core of each of their identities, to manage identity as process and not as a set of characteristics. The are passing from „no entity without identity" to „no identity without a process".

This is why it seems the notion of wisdom itself has to be reconsidered when it is about the Digital Native, as we will see in the next section.

WISDOM AS NEGOTIATED IDENTITY

We observed that the problems posed by the identity of the Digital Homo Sapiens, the human being privileged in the merging process of humans and machines have clear metaphysical dimensions.
We also saw that the discussion's aim is about overpassing the natural taxonomy and about demanding real changes of perspectives and critics.

Can we consider a specific wisdom of the Digital Era?
Is a Digital Native of the 21st century able to be wise?

The whole discussion leads us toward redefining the wisdom itself.
Wisdom is usually understood as "quality or state of being wise; knowledge of what is true or right coupled with just judgment as to action; sagacity, discernment, or insight"[28]

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[26] On those multiple senses, see **What does `identity` mean?** on the Encyclo website: http://www.encyclo.co.uk/define/identity Also see: Wendy Hollway, **Defining Identity - There's More than one 'I' in Identity: An Etymological Search for a Link Between Identity and Identification** http://www.open.ac.uk/socialsciences/identities/pdf/i_in_identity.pdf
[27] Marc Prensky, **H. Sapiens Digital,** *loc. cit.*
[28] From Dictionary.com website: http://dictionary.reference.com/browse/wisdom. On the

Thomas W. Meeks and Dilip V. Jeste, in a recent but already very quoted paper that landmarks the neurobiology of wisdom, have considered several "subcomponents of wisdom" as they were identified in "several published definitions/descriptions of wisdom by clinical investigators in the field", as are the "prosocial attitudes/behaviors, social decision making/pragmatic knowledge of life, emotional homeostasis, reflection/self-understanding, value relativism/tolerance, and acknowledgment of and dealing effectively with uncertainty"[29].

My suggestion is that we could re-definine of the wisdom as capacity to manage fine / delicate / ineffable equilibriums[30]. From this perspective, in the symbiotic relationship with the machine, the humans will bring with them not the intelligence, but the wisdom, the intuition a.s.o. so a valuable added values.

Concluding, let us observe that in our society, we have just passed from individual having a dominant identity, crashing its recessive identities, his "shadow(ed) identities, toward a constellation of concurrent and sometimes alternatives identities, engaged in a permanent negotiation, that could, may be the sign of the wisdom appropriate for our Digital Era.
From human wisdom, we have passed toward digital human wisdom / human digital wisdom - a symbiotic, non-generic and un-unitary wisdom[31].

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[30] From this perspective, the philosophy could be considered as a management of values.

[31] Similar changes could be detected in various phenomena or communities of the contemporary society. The study of the Romanian communities from Diaspora, for example, is suggesting the existence of such a game/play of negotiated identities.

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Can robots interpret texts?

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I. Introduction : phenomenology, hermeneutics and enaction paradigms

While corpora become digital, we propose to begin this paper with a flashback to the foundations of enaction paradigm. Enaction paradigm is based on a theory about living systems whose founder, the biologist F. Varela, has introduced in cognitive science in order to overcome the difficulties associated with computational approaches. Next we will make a brief review of theories about interpretation and phenomenological approaches in order to understand their interest in the comprehension of digital environments for the future of man. We can then consider particular applications requiring a situated interpretation of numerical documents with the help of computerized tools. Thus, we are confronted with the border between reality and "virtuality" and so between man (his embodiment) and system (his numerical environment), i.e. between a man and an artificial entity (computer equipment) which in no way can make of him a robot because it is only a technical artefact that "organize sensory experience" (Stewart 2004).

I.1. Some elements about history of hermeneutics.

It is in the historicity of reception process (and not of emission) that Thomas Aquinas considered the interpretative intelligence according to "that which is received, it is received according to the method of the receiver" (1272)[32]. After the translation of the New Testament from Latin into the vernacular by Luther in order to make it more accessible to all in the 16th century, the 19th century German theologian Schleiermacher, will develop this point of view while giving to hermeneutics, conceived like the art of comprehension, a truly cultural dimension. The reader "must know that the author lived in another world, wrote in another language" (Schleiermacher 1813). So, translation, like an interpretative activity, is equivalent to a re-creation, always opened to "the otherness of the text", (Gadamer 1976) and is not the search of a sense which would miraculously be deposited in a text by its author. Consequently, the interest of hermeneutics point of view focuses on human environment and on context.

I.2. Hermeneutics and phenomenology: distance and incarnation for an obviously subjective interpretation

"The understanding is always the understanding". This assertion is also shared with Ricoeur, considering that the text is the support of communication within and by the distance*, in mediae res*, i.e. neither at the beginning nor at the end but in the center of the historicity of the human experience (Ricoeur 1986). The present invitation at a full and whole participation of the reader is compared by the hermeneutes to a play, to a particular achievement. To be a spectator is determined by the fact of attending the spectacle; it goes along with a lapse of

[32] *Quid recipitur ad modum recipientis recipitur* Thomas Aquinas 1272 Liber de causis prop 10: Somme I,75,5c

memory (a self denial) which is the *sine qua non* condition for entirely attending the play. For the arts based on representation, works enrich themselves by the fact of being carried out, made present, performed. One can find the same approach as Merleau-Ponty in connection with the perception of the painter Cézanne who questions the Sainte Victoire Mountain with a glance. By its light, lighting, shades or reflections, it has become a mountain for the painter who lives nearby "and who invites us to find behind his vision, a community of texture, the flesh which connects people to people and to the things of the world" (Merleau-Ponty 1964).

I3. Enaction as a phenomenology in praxis

In the lineage of the phenomenology of (Merleau-Ponty 1945) the enactive approach which takes into account the body (vehicle of being in the world) obtains an embodied perception, recalling that "the body sees the things, because it is located within them" (Merleau-Ponty1964). But it will register this perception as a temporal experiment: that of a world that arises by itself thanks to action. "The world of action and the world of perception form together a closed totality: the Umwelt". While being interested more by the co-determination than by the connected parts analysis, this position exceeds on the one hand behaviorism like a behavior which can be observed by another person, but also a certain constructivism for which the tools supporting the field of the experiment are constitutive of our knowledge. The world is co-constitutive to us, subject and Umwelt emerge together allowing the enactive coupling to go beyond in a way "beyond the hen and the egg", which "are defined by each other" (Varela 1997), while being focused on the "between two" (the average way according to Varela). Questioning the subject, like the location of cognition is here challenged and replaced by a phenomenological space, an essential interval (Holzem 2009) for the work of interpretation.

II. How do interactions with computers work: what is the user's role?

II.1. Systems known as « input-output» systems

Modelling by means of "systems" consists not only in the identification of various component parts, but needs also to consider the relationships between these component parts and therefore to analyze the interactions which induce a certain level of complexity. That is the only manner, according to Ludwig von Bertalanffy (von Bertalanffy1986) to understand the correct operation of systems (theory based on the study of biological systems).

Thus, the users of computerized systems may be viewed like the system's special component parts and their interactions with the system are of the same nature as interactions between the other component parts. This reinforces the computational approach which postulates that brains are organized like computers so that user's interactions ensue from purely rational behaviours (cognition is a computation).

The systemic approach related to cybernetics, has had a significant development by connecting to automation which aims at the command of systems in particular. However the underlying model is for Varela (1996b) only an external point of view on systems viewed like "black boxes" provided with "input-output" which act in accordance with their ambient conditions.

II.2. « Obstinate »research foundation coupled with a "Stubborn search" of a predictable behavior

Paradoxically, if the computing and algorithmic methods used by search engines are optimized and reliable, we see that they are linguistically very poor, in their own functioning but also during interaction with users. The user request is considered as a list of keywords (with breaks and emphasis included, rarely taking into account the writing order) whose words are lemmatised before being sequenced (all requests are processed independently of each other).

In man machine interaction, designers try to put user's intentions in the software and this thanks to ontologies able to convey any kind of intentions and able to last a long time. Consequently during the use of web browsers, the challenge is to create a user profile and then to match it with a knowledge data base.

This approach makes the assumption that the semantic value of a passage of text is only the result of its writing by the author and then in the algorithms that just recognize a words meanings which have been fixed forever in an ontological network. If we take the contribution of hermeneutics and of phenomenology into account, this is a mistake: sense does not lie in the text but rather in the reader's context.

We build and we use ontologies, like a librarian who, for decades, indexes books with a static reference frame to determine once and for all its representations[33]. This, because access to complete texts was impossible, (*i.e.* to forget text in fact). This is a very old practice which carries on today, because it offers the illusion of an easy mastery of the information content and it controls over shifts of meaning. We do not forget that mastery of information content has become strategic for business intelligence.

From an epistemological point of view, these conceptions lead to a behavioral formatting. In order to succeed this formatting of human behaviour and in order to be able to predict it, the ontologies have to dissolve the difference between languages. A hub for an international language, as Wordnet created by Miller and his team is therefore a perfect tool for this formatting. "They reduce language to a nomenclature which describes neither textual structures nor the considerable variation of genres and discourses" (Rastier 2008). Indeed, if we consult Wordnet web site we could see concrete effect of that position: for instance consulting of the Topic "French recipe coq au vin": we can read "cooking recipes" "(chicken and onions and mushrooms braised in red wine and seasonings)" (Wordnet source). But everyone knows that a chicken is not a rooster and we can not cook a chicken like a rooster (except for the boiled chicken). That is not important for Miller and team, because the world is the same for everyone on the web planet. Then, we wonder about the current status of vehicular language today[34] . We are now in a situation of standardization based on the principles of

[33] This conception postulates that representing of knowledge is relatively independent from vernicular substratrum

[34] compared with the status of Latin language centuries ago

the cognitive universals, very convenient to build categorization with which users are encouraged to conceptualize and to think.

No doubt that this standardization facilitates the profiling of less human users with their diversity than increasingly robotized in their consumer behavior.

II. 3. Men, machines and neuronal operation

In the field of theory of mind, research studies were first devoted to cybernetics and then to cognitive sciences. The roots of this scientific work has been a communication from McCulloch & Pitts (1943) titled "A Logical Calculus Immanent in Nervous activity". In this paper they suggest that logic is the fundamental principle of the brain mechanism. This one would be composed of parts that embody logical principles. The whole brain would be a deductive engine (Varela 1996b). These ideas with Von Neuman's work, and linked with the Turing machine, will give birth to the computer.

The basic hypothesis of computationalism is that there is not only a behaviour similarity between the living human brain and the computer, but more an identity in the functioning principles: logic implemented with a finite state machine.

According to Jean-Michel Roy (Roy 1999): "In the late 1970s, connectionism introduced a novelty by proposing that the cognitive machinery is not a system of rules for the manipulation of symbols, but a system of networks that give rise to typical and regular dynamical behaviour that can be interpreted as rules at higher levels of description. … However, connectionism shares with computationalism an unquestioned *representationalism* according to which internal entities stand for or correspond to world properties and events."

But the embodied-enactive view questions the relevance of representations as the explanatory device for cognition and has been taken up with vigor in various areas generating lively philosophical debates (Clark 1997).

III. Outline of a digital hermeneutics

III.1. "Abolishing text amnesia"(Rastier 2008)

To better understanding, we will compare digital and traditional reading (a human in front of a screen versus a human in front of a lot of texts or books opened up put on a desk or a lectern. Opening many books put on a desk is not very easy, even when the desk is large. From this point of view, the screen seems much more attractive to browse from a text to another without having to turn pages. Nevertheless, seeing a book, a periodical or other publication which you are used to, you can say if its is a research publication or a scholar book, simply because you recognize the logo of the editor, the color of the cover etc..according to our practice of the textual genre. But, while browsing through the web we are not in front of texts with their peritext (elements of interpretative guidelines), but in front of data. Among (Rastier 2008) we do not know "the context of the corpus within which texts and the information they contain take on meaning, the points of view which shaped information and on which it depends, the various groups for whom the information is destined…" Those elements are taken into account neither in web data, nor in knowledge representation. Consequently we

uphold here the François Rastier[35]'s discourse for the defence of data attestation on the web and for replacing the semantic web by semantics of the web (for a recontextualisation of the notion of data). It is for us a prerequisite condition which involves ethic behaviour in digital hermeneutics, in order to control the linking of numerical data.

What does taking into account the textual data exactly mean? If we consider that the meaning does not lie in a text but in the condition of interpretation, why is taking textual data into account so important?

- First, because, in agreement with the hermeneutics theory, the textual context (structure which indicates paths, waystage of interpretation), philological context (the whole corpora within which text is extracted) and historical context (philology in the lineage of other texts from the same genus), are all interpretative elements.
- Secondly, because with digital documents, we can now access through textual requests (*versus* access to content through keywords). We can use language text software tools (browsing through a very large corpus- increasing our connecting texts ability and therefore their understanding).
- Thirdly, according to hermeneutics and phenemological position and particularly to enactive position, we shall be careful in making up a corpus of documents because this constructs our understanding (such as the enactive coupling between subject and his Umwelt: here sourroundings of texts) while building up corpora. This dialectic takes Ricoeur's notion of ethic and ipseity into account. Unlike *idem* identity, *ipse* identity does not depend on something permanent (reproduction of sameness exactly) rather it depends upon narrative identity which involves otherness. In other words the community of the others: the authors (identifiable by textual attestations, see above) with whom you are in textual interrelationship, and with whom you share your personality. We are particularly interested by the interplay between readerships and texts in identity formation. Furthermore in Ricoeur's theory, there is no entity called self, only selfhood constituted by intersubjectivity. Now, we have to look into parallels between the notion of ipseity i.e. selfhood-identity (Ricoeur in hermeneutics) and the notion of person (Varela, Vermersch, Petitmengin, Depraz in neurophenomenology) in order to draw up our field of research in human epistemological position before conceiving a new numerical interface.

III.2. In order to complete a technological achievement by means of an epistemological thought about humans standing in front of a screen.

- An ethical position.

Considering that individual human consciouness is formed in dynamic interrelation between self and the others (therefore inherently intersubjective), we uses Ricoeur's hermeneutic of selfhood in order to develop an epistemological reflexion on human position in front of a screen during a digital browsing among a corpus of documents supplied with linguistics and statistic software for exemple. By characterizing ipseity as the capacity to interrogate himself, Ricoeur argues that a person's narrative identity lies between an *idem* (sameness) and an ipse (selfhood). For us this question seems very relevant to digital document time. Indeed, hypertextuality allows the activation of the

[35] who calls to abolish text amnesia

reflexive dimension of the corpus (the texts are reflected in each other, according to the user's navigation: revolutionizing his relation to texts and to textuality).
According to Ricoeur's hermeneutic posture, the process of self identification is dynamic and fluid based on interaction with the communities of which we are parts. He takes into account the fertile precariousness[36] of life which, (because we are never the same, but we become another) outstandingly illustrated in biology by Danchin in "the Boat of Delphi[37]"in order to understand the unstable equilibrium of living system. The myth of the Boat raises the disturbing question of the ceaseless change necessary for life and thus that of ageing and degeneration. The individual ceases being apprehended in a cumulative process from a cognitive point of view, and his intellectual abilities then depend largely on stimulations (disturbances) in his environment. This invites us to take interest in the conditions of couplings (socially, economically, culturally) which constitute the context in the broad sense (historical transmission) and narrow (*hic et nunc*).
The ethical, or rather deontological position fits what Rastier names a praxeology or theory of the action (Rastier 2001). We cannot separate interpretation from the conjunction of a text with the cultural point of view of the reader. This point of view belongs to the "identitary zone"[38] (Rastier: the semiotic of anthropic zones) where men act (*hic et nunc*) and perceive their own acts through environment (Umwelt in phenomenology).

- A first person experimentation

This kind of intersubjectivity makes the place of the person (*versus* myself) clear, i.e. ipseity in Ricoeur theory. "Between my body and this other: my person," writes Nathalie Depraz (Depraz, 2008) who suggests a definition of "person" as an embodiment of our attentive and temporal human being (linking corporeity with intersubjectivity). The person is unstable, does not exist permanently, he is a social instance, who actualizes him in context during interaction with others: like a character in literature who exists only in the present time of reading (by and for the readership).
How could taking "the first person point of view" help in an assessment of the relevance of enaction theory in which the inside and the outside, the man who knows and his knowledge, the mind and the world, determine each other? (Petitmengin 2006) We ask the same question, in the context of digital work environment, in order to get a better understanding of interpretive space resulting from subject / world pairing.
Focusing on the ongoing experimentation by a user browsing, he could be offered the possibility to experiment his own understanding by returning afterwards to his own interpretive trail: capturing traces of his navigation, constituting a material of choice for first-person experience.
Gathering observable traces and breaking with the "third person" interviews of cognitive theories (because we refute the observer's neutrality), we agree with Vermersch when he speaks about experiential possibility (i.e. *consciousness reflected* by Vermersch who follows Varela's theory). By seeing oneself act retrospectively while using software-tools and with passages he has picked and with the moments when they

[36] The enactive approach makes it possible, according to us to think the "living system's fertile precariousness".
[37] By reference to the myth

[38] The Identitary zone (point of view), the Proximal zone (the communication environment) and Distal zone (the norms), take part in the triple semantic situation of the individual.

appear on the screen, we could understand better both human experience in action, and the process of interpreting in a praxeological perspective.
This approach refers to the "ipse" as defined by Ricoeur as reflexivity (What we are trying to do is aid to become aware of moving from what is implicit lived to his own explanation) as Vermersch writes "We are unaware of what we do not understand" (Vermersch 2000). Phenomenology coupled to hermeneutic approach responds to this: we perceive only what we can interpret and "it is before the text that we understand ourselves" (Gadamer 1976).

III.3. Microworlds

According to Francisco Varela (Varela, 1999), "lived time is not physical-computational. … the exploration of time entails the gesture of reduction and the identification of descriptive invariants … . … time in experience is quite different from time as measured by a clock". So during a human experience putting computer at stake, we are able to describe processes and their duration when they run in the computer. But for cognitive processes we can speak only about "microworlds" and "micro-identities" (Varela 1996a) which induce the different behaviour that arises and disappears. Coupling between users and context is here a coupling between computational processes which can run in parallel, or in the background, and this behaviour which occurs and allows a very useful serendipity.

III.4. On the interest of enaction paradigm?

For the enactive approach, which is non representational in essence, the problem to address is not to represent a predefined world viewed by an observer, but is to conceive an artificial system viewed from its own point of view. And that does not allow considering "input- output" sytems. The relations with the environment are therefore seen as "perturbations". According to this approach, to conceive aid by computer systems we must first consider software processes like processes used during experimentations in such a manner that inside and outside are indissociable from the system point of view.
While conceiving computer aided resources to browse the web or a corpus of documents we have to consider that human-computer interfaces are "visible" only when they are unused and are not visible (but very useful) when they are in use, like spectacles: "put down" mode *versus* "in-hand" mode (Havelange 2003).

A dominant feature such artificial systems intended to take part in the cognitive experiment relate to their capacity of coupling due to their properties of self-organization. This question is no longer within the competence of the "resolution of problems", but of that of the "definition of problem", such as Varela proposes (Varela 1996b). And this is achieved by the coupling of men and machines with this particular environment. Intelligence is no longer defined as the ability to solve a problem, but as ability to penetrate a divided world." (Varela 1996b). We propose to set up the structural coupling which enables to integrate software technique into cognitive practice. In fact, this structural coupling implemented by the data-processing experimental device will make it possible to associate him in particular: "… this strange faculty of the human mind which is to connect..." Gianbatista Vico (Vico1744).
Here we encounter an aspect of serendipity that is the "sagacity" of being able to link together apparently innocuous facts to come to a valuable conclusion. And this competence is a very useful one for browsing, navigating or interpreting corpora.

To bring this competence to our system's users we may use algorithms developed initially for very sophisticated retrieval pieces of sofware. This sofware "… forces us to view data mathematically first and establish a context for it later" and so "…Google founding philosophy is that we don't know why this page is better than that one: If the statistics of incoming links say it is, that's good enough … No semantic or causal analysis is required" says Chris Anderson (Anderson 2008). Then sense making is really brought by the user and above all by his cognitive competences.

IV. About a customizable digital environment

For our first experimentation we aim to improve human interactions of various professional categories with an information system dedicated to transport law and logistics. The goal is to exploit a digital environment of work for professionals (logistic companies, lawyers, risk managers, insurers…) and non-professionals (users). Our system privileges an interpretative approach in the formulation/reformulation of requests, as well as data visualization. Finally, this digital environment can increase thanks to successive contributions due to dense and complex interactions with users (or groups).

Our positioning is based on the interworking of operational tools to discover new practices of navigation in a textual corpus. It is also based on our preceding search results.We already developed a system called ACTI_VA (Saidali 2007), allowing the acquisition and the valorization of knowledge in the field of document image processing. This software exploits a library of tools to link up during a complex process of image interpretation (that could be used with text). The originality of the ACTI_VA model in terms of interaction is the presentation of sequence of tools use with a management of historics. The user has the possibility to test different kinds of presentations and does not have to reformulate his whole request in case of nonrelevant result, while keeping traces of already played scenarios. ACTI_VA gives access to large capitalized informations, to present relevant documents in answer to a user request.

The experiment of documentary cartography in the Proxidocs (Roy, 2007) project will also be used and exploited for the design of a digital environment of work. The goal of ProxiDocs software is to immerse the user (or a small group of users) in interactions that enable to highlight the corpus density, to extract principal themes (among those that he chose according to his own interest) of each document and to allow a fast access to each document or passage of document. Within these interactions this tool enables to produce and then navigate into personalized graphic representations (Fig 1).

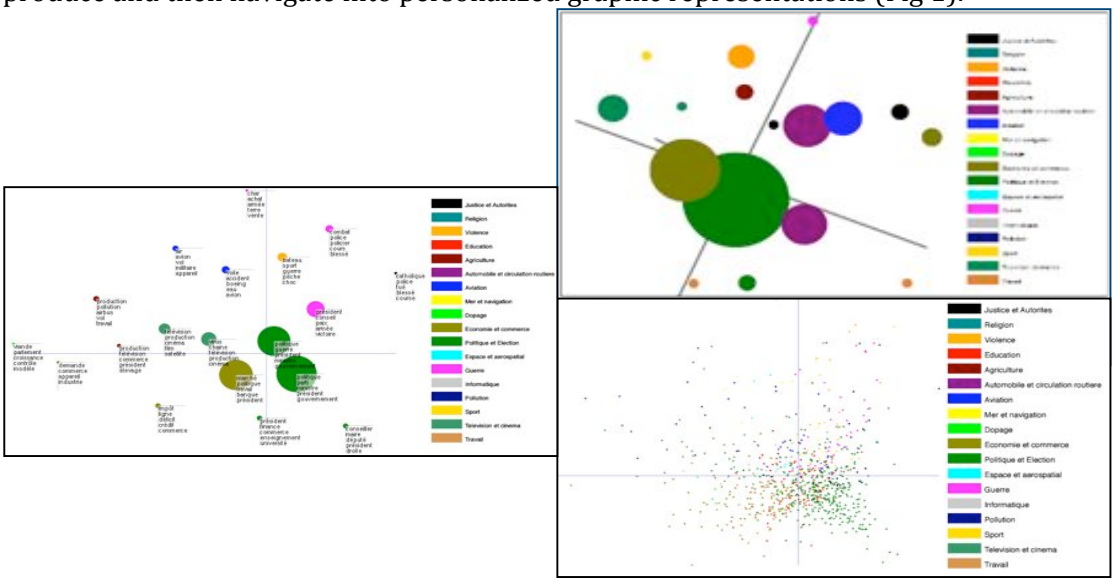

Figure1: Graphic reprsentation of documents

Currently our strategy for improvement of information research, we offer the user several approaches to browse whole documents, to display, handle and organize the result of his research. In particular, he will be able to use the history of his navigation, his own traces, but also those which are related to his sphere of activity. It will thus be a question of observing the user in his activity, and of enabling him to exploit this observation dynamically. With these traces (voluntary or involuntary), we do not seek to model a behaviour to make prediction, but to have description and analysis tools of intertextual navigation in real situation.

Visualization and analysis of the results of research are necessary steps which follow the total process of information research. The information perception is linked to decision making in the context of use of the proposed system. It is thus initialized by a trade task or a personal motivation; it reflects a culture and organisational constraints, or social norms. Interpretation tasks evolve with the progress of recognition/satisfaction in information need. In this context the user identifies the documentary sources, formulates requests and examines the results; he appears in the middle of an iterative loop *"formulation-analyze-visualization-reformulation*".

The process is thus initialized when a user identifies an information need and tries to satisfy it by undertaking one or more research tasks. He takes decisions on the strategies to adopt, the tools to exploit and the corpus or part of the corpus to consulte. Each information unit discovered can set off new ideas; suggest new directions and change nature even need for information. Then we emit the assumption that, management in a form of histories of traces left by different users can help to discover new strategies and new information.

About information extraction, each action implies a cognitive and physical engagement, and can induce a dynamic evolution of the interface or emerging knowledge. We try to facilitate the coupling and engagement of the user by offering him simple tools for handling/selection/moving the documents results, also for the dynamic expression of requests. The digital environment of search and visualization for information that we propose, presents the following services:

- Interactive definition (graphic or not) of the requests.
- Classification according dynamically definite attributes and items by the user or the user group.
    - With a hierarchical display that the user can easily reconfigure
    - With different points of view of (Topics, categories, dates of edition, size, number of card….etc) expressed and re-organisable by the user. These points of view make the user able to add appropriate constraints to its research context (problems to be solved and competences).
    - With the whole or part of visualized documents, the user requires similar documents.
- Visualization of research results:
    - List, 2D presentation in the form of hyperbolic clusters, 3D space as the cone trees or Semantic Zoom.
- Tools for extraction and analyzes whole or part of a document in the corpus.
- Dynamic refinement of the research context in a filtering zone.

So our experimental approach consists in using dynamic space representations to design and implement a generic platform in personalization of visualization and integration of various and heterogeneous methods. Navigation in data and visualization at different levels of the whole documents enable the user to create his own interpretative course. In the human-machine coupling, the user's interpretations and machine calculations are not in competition, they are actually complementary. The goal

of machine activity is to produce by interaction; the traces which will be used in user's interpretations.

V. Conclusion: Interpretation as « enaction of » :

According to Stewart for artefacts, and in our case, for computers or for computerised system which may be linked to the web "… it is the human subject, using an (appropriate, well-designed) interface who enacts a world". And we have addressed here the problem of interpretation aided by a computerized system in such a manner that we have developped a position (digital hermeneutics like?) to conceive a "well-designed" interface, or more exactly, to conceive the way a user can interact with a computerized system composed of existing mathematical tools of which he is really the "cre-actor"(Stewart 2004).

Some examples have been given here which show that interpretation (in a cognitive sense) needs human abilities which may be helped by an opened system giving them the maximal autonomy.

From this point of view, robots cannot interpret texts. During our interaction with a numerical environnement we do not become half robot but more human by developing our abilities to connect and therefore suggest.

Our communication is intended to be a reflection on the position and role (prosthesis) of tools which surround us: a reflection to understand what the user becomes by conceiving this new type of digital interface.

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Cybernetics & Golem Inc.

Michel Faucheux

In 1964 Norbert Wiener writes a small book the title of which is *God & Golem Inc*. He makes a link between cybernetics and the myth of the Golem. For him, the machine is the modern counterpart of the Golem of the Rabbi of Prague. This analogy is provocative. Why is it useful for a scientist such as Wiener to make a link between cybernetics and a myth? Is the myth a tool itself which gives us the ability to understand the true nature of the relationships which exist between human beings and machines, especially since cybernetics builds a new interplay between them?

So, in this chapter, we will try to examine the use of the legend of the Golem by Wiener and the mythical aspects of cybernetics.

Then, we will be led to study the concept of mediation which can be extracted from this relationship between cybernetics and legend on the one hand, and, more generally, between myth and technology on the other hand. We will try to show that this dimension of mediation is essential to think technology for it belongs to culture and is bound with the imaginary. We often see technology as a production of mere, concrete, technical objects without a symbolical dimension. As suggested in the word techno-logy, there is "logos" in the technical process, there is language, and more precisely, there are narratives.

This is why the Golem's legend appears as a way to understand the deep stakes of cybernetics, the new relationships between human beings and machines, but also as the new paradigm of reality which is set up by this new science. Giving a mythical aspect to cybernetics, Wiener shows us that we are now entering a new era of knowledge: the artificial era.

Cybernetics and the legend of Golem

Cybernetics science has military origins. Norbert Wiener, during WWII, has participated to the war project AA Predictor, While studying anti-aircraft fire control, Wiener has conceived the idea of considering the operator as part of the steering mechanism and of applying to him such notions as feedback and stability, which had been devised for mechanical systems and electrical circuits.

> I had become engage in the study of a mechanico-electrical system which was designed to usurp a specifically human function –in the first case, the execution of a complicated pattern of computation, and in the second, the forecasting of the future (Wiener, 1948, 1961:7).

The word Cybernetics comes from the Greek word *kubernetes* which refers to the action of governing a ship. It refers itself to a logico-mathematical approach which deals with process of communication and command which is the basis of computer science and artificial intelligence. “We have decided to call the entire field of control and communication theory, whether in the machine or in the animal, by the name Cybernetics” (Wiener, 1948, 1961:11)

The field of cybernetics is the study of how information circulates and gets organized, what allows to control and to govern the whole process, with its effect of feedback. One of the main contribution of cybernetics is to find out a new dimension of reality as underlined by Mathieu Triclot (Triclot, 2008). According to him, cybernetics is a scientific revolution which has discovered a new dimension of the world: the dimension of information, another constituent of reality such as matter or energy. Information which is common to human beings and machines finally erases the difference between them.

Besides, as said by Wiener, the aim of cybernetics is to build a mechanico-electrical system designed to usurp a specifically human function. In this way, it also proceeds to an elimination of the difference between human beings and machines which explains the symbolical reference to the myth of Golem.

The Golem is a creature of clay created by magic. The word golem comes from the Hebrew word *gelem*, meaning raw material which appears in the Psalm 139 in the Bible. The word refers to the "shapeless mass" to which God would have given the breath, allowing it to become “Adam”, the first being who is made of clay, blood and of the divine spark (the letter aleph).

There are many versions of the Golem's legend. In the polish version, the Golem is a creation of the rabbi of Chelm who engraves the word *Emeth* (truth) on the forehead of the Golem. The word *Emeth* gives life to the Golem. When the letter aleph is rubbed off, the word *Meth* only remains. And then, the Golem is reduced to dust.

In the version of Prague, which appears during the eighteenth century and which is popularized by Berthold Auerbach in his book *Spinoza* and by the journalist Franz Klutshak, the golem is created by the rabbi Loew of Prague (l5l3-l6l0) (who is a historical figure living during the sixteenth century) in a different way. The rabbi Loew

puts in the mouth of the Golem a piece of paper where is inscribed the sacred name of God. This version of the myth is used by Gustav Meyrinck in his novel *the Golem*.
In the legend, the Golem gets through a lot of works instead of his master and puts itself in the service of the Jewish community of Prague. He can defend the community but he cannot speak. The day of the Shabbat, the rabbi takes off from the golem's mouth the sheet of paper where is inscribed the word of God. The day he forgets it, the Golem destroys everything. When the rabbi finally succeeds in taking off the sheet of paper from the Golem's mouth, it is immediately reduced to dust.

Wiener's reference to the legend of Golem is confirmed by Gershom Scholem, the great specialist of Jewish mysticism and *kabala* who, in 1965, in an official speech in Rehovot, during the ceremony of inauguration of a new computer built by Dr Haïm Pekeris, gives to this computer the name of Golem. Scholem, in the same speech, also adds that rabbi Loew was the Spiritual ancestor of Norbert Wiener. (Scholem, 1974:472)
Thanks to this reference, Wiener registers computers in the long genealogy of the artificial beings which have been imagined by humans and gives a new existence and a new meaning to the legend when applying it to cybernetics. But, if cybernetic machines can be a materialisation of the Golem, it also means that the story of the Golem plays a role of symbolical foundation of cybernetics. This legend is the way which makes it possible to give a mythical dimension to cybernetics and to think technology otherwise.
According to Wiener, there are three precise reasons why a comparison can be done between the computer and the golem: the ability to learn, the ability to reproduce themselves, the new coordination of machine and man which is implied. "One of these concerns machines which learn; one concerns machines which reproduce themselves; and one, the coordination of machine and man." (Wiener, 1961:11). We must now try to study these three aspects of Wiener's comparison.

The mythical aspects of cybernetics

The Golem is the being who is created by magical and artificial means which are a reproduction of the divine act of creation, as if, according to Wiener, the human attempt to make doubles, reproductions of him-self, referred to the creation of Adam who was made in the image of God. Cybernetics opens the path to build artificial creatures which are man's image.

> Man makes man in his own image. This seems to be the echo or the prototype of the act of creation, by which God is supposed to have made man in His image. Can something similar occur in the less complicated (and perhaps more understandable) case of the nonliving systems that we call machines? (Wiener, 1964: 29).

But the word image has to be defined. The Golem machine is not a pictorial image but an "operative image" (Wiener, 1964: 31) of man. It reproduces some of his functions.

> Besides pictorial images, we may have operative images. These operative images, which perform the functions of their original, may or may not bear a pictorial likeness to it. Whether they do or not, they may replace the original in its action, and this is a much deeper similarity. (Wiener, 1964:31)

However, what is a machine? According to Wiener, "a machine is a device for converting incoming messages into out-going messages. A message, from this point of view, is a sequence of quantities that represent signals in this message." (Wiener, 1964: 32) This definition has a philosophical implication. It erases the human-machine difference. Humans and machines obey a logic of communication. They have the same informational being. They receive and transform information. Communication is the new paradigm which enables us to describe mankind, as mechanics and watch making in the seventeenth century, for instance. At last, what characterizes machines themselves is, as underlined by Wiener, their ability to reproduce themselves just as humans. Wiener, for instance, gives the example of the "transducer": "it is possible to multiply a machine, say a linear transducer, by a constant and to add two machines." (Wiener, 1964:39)

The reference to the Golem, for Wiener, can also be understood otherwise. Machines are not only automats, they can replace human beings. Because of their ability to learn by themselves, they can compete with humans, like game machines. Wiener gives the example of a program written by Dr A.L Samuel from IBM Corporation which allows a computer to play a game of checkers and to learn by improving its playing with its own experience. (Wiener, 1964:11). By pointing out the ability of machines of reproducing and learning by themselves, Wiener updates the myth of the replacement of man by machine popularized in the XIXth century and XXth century literature. Moreover, his example of a computer joins the popular imagination, where there is often confusion

between cybernetics and robotics. In 1960, Manfred Clynes and Nathan Kline invent the word *cyborg* (« cybernetic organism ») to refer to a being that, instead of man, could live in the extraterrestrial space. And as we have already seen, Gershom Scholem himself identifies a robot and the Golem. Wiener himself, in his book *God & Golem inc*, refers to the play RUR (1921) by Karel Capek (who invented the word "robot"), which deals with a revolt of robots against human beings (Wiener, 1964: 55).
He also insists on the fact that if human beings can be replaced by machines, the social consequences of such a situation could be catastrophic:

> We are already in a position to construct artificial machines of almost any degree of elaborateness performance. Long before Nagazaki and the public awareness of the atomic bomb, it had occurred to me that we were here in the presence of another social potentiality of unheard of importance for good or evil.(…) the modern industrial revolution is similarly bound to devalue the human brain, at least in its simpler and more routine decisions." (Wiener, 1948-1965: 27)

This situation is the result of man's attitude that abdicates his responsibility and transfers it to machines. Man is characterized by his desire "to avoid the personal responsibility for a dangerous or disastrous decision by placing the responsibility (…) on a mechanical device which one cannot fully understand but which has a presumed objectivity." (Wiener, 1964: 54)
So, if the cybernetics machine embodies two human characteristics, the ability to learn and the ability to reproduce, the problem which is raised is the nature of the relationship between humans and machines, the coordination between them. This coordination can be thought through a myth which is typical of the nineteenth century: the myth of the sorcerer's apprentice.

In his book *God & Golem* Wiener refers to this myth (Wiener, 1964:57) and writes : "I have said that the reprobation attaching in former ages to the sin of sorcery attaches now in many minds to the speculations of modern cybernetics." (Wiener, 1964:49). He refers also to the Goethe's poem, "The sorcerer's apprentice". (Wiener, 1964: 49)
The specific link which is made between cybernetics, the legend of the Golem and the myth of sorcerer's apprentice is meaningful. The Golem escapes from his creator and causes destruction and disorder. Indeed, the legend can also be understood as a denunciation of the risk of machines which have become

autonomous. Wiener denounces the danger of an autonomous machine, rigid, mechanically programmed, reacting literally and unable to face the unforeseen just as the Golem which is as suggest the Hebraic word, an "idiot".

This rigid logic characterizes human behaviour when a complex technological process is used, as if mankind was already mechanized. An example of such a situation is given by the making of the atomic bomb: the scientists of the Manhattan Project continue to fabricate the bomb whereas Nazis were defeated. The atomic bomb was used for another aim than the initial one.

As underlined by Wiener, the theme of the myth of the sorcerer's apprentice is the danger of magic which implies literal-minded reactions. "This (danger of magic) lies in the fact that the operation of magic is singularly-minded, and that if it grants you anything at all, it grants what you ask for, not what you should have asked for or what you intend." (Wiener, 1964:59)

By referring to the myth of Sorcerer's apprentice, Wiener anticipates not only the danger of relation between humans and machines in which humans leave their responsibility and intelligence to machines, able to act only on a literally way. But he also puts in light the aim of technology which is to think and invent a coordination between humans and machines. "Render unto man the things which are man's and unto the computer the things which are the computer's. This would seem the intelligent policy to adopt when we employ men and computer together in common undertakings." (Wiener, 1964:73)

Cybernetics mediation and the paradigm of the artificial

The legend of the golem, when applied to cybernetics, raises a problem that drives us to question technology, its impact on our world and us: the problem of mediation.

Why does Wiener refer to a legend to describe the nature and the consequences of cybernetics? What can be the role of technology? Mediation is perhaps a way to underline that technology, as seen in the formation of the word, is also made of "*logos*", narratives, legends, myths…There is, in other words, a symbolic dimension of techniques and the process of mediation is a component of techniques. Technology and narration are linked. Narration is a way to give a meaning to the artefact, the tool, the machine. To conceive a technical object implies to tell a story which permits to give sense to this object. Narration makes sense. Tools or machines bring with them some meanings, they tell a story. In other words, the process of technology is also a process of

symbolisation. Of course, this philosophy of technology implies a specific representation of narratives. Narration is not seen as specific to literature, written or oral literature. It is seen as a universal way of knowledge. There are narratives in the every day life but also in the scientific process, the technological process, the philosophical process …etc There is a fundamental aptitude of human beings to make knowledge by inventing and telling stories. As underlined by Lorenzo Magnani, if human beings have solved their problems of survival and reproduction by distributing cognitive and ethical functions to external non-biological sources, props, artefacts, it seems that myth and narration are the mediation which makes possible this transfer of competences. Myth is the way used by humans to put their imprint on artefacts in order to use and think them as a continuation of themselves.

Besides, the legend of the Golem is by itself a legend of mediation. The Golem, created by human beings, has a function of mediation:
-between the humanity and the divine who have a power of creation.
-between human beings themselves. Indeed, the Golem, in some versions of the legend, can play the part of defending the Jewish community. It expresses the social role of techniques which produce social links and help to structure society.
-between humans and technique. The golem suggests that the destinies of mankind and techniques are connected.
This legend expresses the technological essence of the human being, who is a creator, who uses technology as mediation with nature. It shows the link which can exist between technology and mediation. But, the reference to the myth of Golem has another interest: It expresses a specific kind of mediation, introducing us to the specific essence of modernity, its strangeness.

Walter Benjamin uses the concept of phantasmagoria to describe the transformation of industrial reality (Benjamin, 1972:375). He means that, in the industrial context where the dynamics of reality is both economical and technological, humans are transformed in things whereas things become subjects. The fetishism of the goods engenders an effect of phantasmagoria. This process of symbolical transformation can be illustrated by the legend of the Golem as far as the Golem itself is a thing, made of clay, an artificial creature. The legend of the Golem may be red in a new sense: it can illustrate this transformation of the human in a thing and reciprocally, the animation of things, which is the characteristic of phantasmagoria.

It can also illustrate the feeling of an "uncanny strangeness" described by Freud which is created when you doubt if an animated being is living or not. Indeed, one of the characteristics of industrial technology, from photography and cinematograph to virtual reality, is the ability to make artificial reproductions of reality (just as the rabbi Loew who makes a reproduction of the human creature by creating the Golem) which can create this feeling of "uncanny strangeness". This strangeness is caused by our shift from a natural world only transformed by techniques to a new artificial world in which the human is becoming a thing, where there is no longer difference between mankind and machines and where the imprint of humanity on the world is disappearing: a world created by techniques, by the dynamics of technology. This shift raises the fundamental question of identity which is central in the human-machines interaction, as shown by Colin Schmidt in his research works.

Indeed, we are entering a new era, the artificial era, and we need to fabricate the philosophical, epistemological tools to think this new paradigm of the artificial which replaces the ancient paradigm of nature.

The first step to develop a philosophy and sciences of the artificial (Simon, 1996) is to think technology itself. Wiener, when he writes his book *God & Golem inc,* makes an unusual link for a scientist between myth, legend and technology. Wiener's purpose in his book is to make a link between science, myth and religion.

Wiener, by giving to his book the title *God & Golem Inc,* suggests that the idea of God and the character of the Golem are incorporated in science and technology, that, in other words, there is a symbolic dimension of science and technology. He suggests that technology has not only a power of material but also of symbolical transformation.

This link, however, appears as a kind of "collision" an "impingement". Precisely, the under-title of the book is "a comment on certain points where cybernetics impinges on religion". This word suggests that this link is creating violence, semantic disturbance. But, precisely this disturbance appears as a way to think the new paradigm of the artificial by thinking technology as an activity which can create its own reality. In other words, Wiener shows us that technology has a symbolical impact on spirits which prepare them to accept the shift to a new era where human beings can be replaced by machines, but also where there is no difference between mankind and machines, where biological and mechanical components are merging.

For this reason, we can understand the title of the book otherwise. We may indeed consider that this title also suggests that legend and machines, myth and techniques are incorporated. Machines are not pure material tools but meaningful artefacts. They are semiotic. This is a path to understand the new paradigm of the artificial.

Myths, and more precisely, narration, are used by mankind to speak of technology but also to make a deep understanding of its potentialities. Myth can be seen as a way of understanding artefacts by using them as semiotic machines. It does not have to surprise. Language and technology which are produced by the same cerebral activity are linked together. “Man makes concrete tools and symbols, both recovering from the same (cerebral) process.” (Leroi-Gourhan, 1964: 162-163). Narration is the tool mankind uses to integrate technology in his world, to measure the dangers or potentialities of a technique and finally to accept the shift to the artificial era where the border between humans and machines falls out.

Narration has a function of mediation between humans and technologies. Thinking this symbolical mediation is to try to think the passage from the animal to the human, from nature to culture. That's the reason why myth, paradoxically, when referred to tools and techniques, can be seen as the way to build technological wisdoms. No doubt that the necessity of a digital wisdom defended by Viorel Guliciuc may pass by the appeal to the myth.

This is why cybernetics and Golem can be incorporated. We do not interpret Wiener’s reference to the Golem as a bridge built over the gap which separates science and religion but as a way of thinking technology, of showing the semiotic dimension of techniques, the linguistic dimension of them.

More precisely, the myth of the Golem is the way to show the merging of humans and machines and the passage in the new artificial era. This myth allows to raise the problem of the human-machine relationships which is more largely studied in this book by Olga Lodombe.

Understanding the new artificial era, the new relationships between humans and machines, begins by thinking the semiotic value of machines which, at the same time, produce a wide range of meanings and a new kind of reality.

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BRAIN-COMPUTER INTERFACES AND QUANTUM ROBOTS

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1. Introduction

The Brain-Computer Interfaces (BCI) are systems that acquire and analyze brain signals (typically of electromagnetic nature) to create high-bandwidth communication channels in real time between the human brain and a computer (see for an overview, e.g., Dornhege *et al*., 2007). Most often BCI are designed to capture subject's intentions in order to drive suitable actuators, performing the actions wanted by the subject himself. However, even if BCI seem to open the way for a deep merging between human minds and computers, their actual implementations still appear as unsatisfying and very far from reaching the goal of a complete integration between human beings and artificial devices.

In this paper we will introduce some arguments supporting the impossibility of reaching this goal within the design framework actually used for BCI. In short, this impossibility is due to the fact that actual BCI are designed to allow a *computer-to-computer* communication within a classical context. However, recent studies lead to the conclusion that the human mind is *not* a classical computer, and, in general, not completely reducible to any kind of computer (not even classical) because of the non-algorithmic nature of some mental processes. Moreover, we will argue that most mental processes should be described by Quantum Physics. Among these processes there are control processes acting on most mental operations which, otherwise, could not be performed. As control processes can be seen as a sort of metathought, the logic underlying them can be viewed as the one of a (quantum) *metalanguage* describing most high-level mental processing, such as reasoning, decision making, recalling from memory, and the like. A quantum metalanguage reflects into a quantum object language, and controls the latter.

If we adopt this theoretical framework, it follows that, provided we have at disposal new kinds of BCI, allowing a *quantum-computer-to-quantum-computer* communication, we could use human mind to control, through its quantum metalanguage, the operation of an artificial quantum computer. The whole system constituted by a human subject and an artificial quantum computer (controlled by the quantum metalanguage of the subject himself) is a new kind of cyborg, called *Quantum Cyborg* (QC). The latter (see Zizzi, 2008) would allow a deeper integration between human mind and artificial devices. As the practical implementation of a QC requires to solve a number of difficult problems, such as the one of avoiding decoherence induced by external environment, in the final part of this paper we will shortly outline some possible strategies for coping with these difficulties.

2. The conceptual problems underlying BCI design

The design of a BCI requires the solution of a number of hard problems:

1) Knowing what features of brain signals are associated to specific kinds of intentions or of mental states.

2) Selecting the best techniques to detect these features in presence or noise and artefacts.

3) Finding the best way to implement online the sequence detection-action performance.

So far these problems have been dealt with by resorting, on one hand, to experiments on human subjects which imagine to perform a given action, and, on the other hand, to soft computing algorithms, like the ones allowing artificial neural networks to learn, relying only on examples, to mimic whatever kind of input-output relationship (see, in this regard, Bishop, 1995; Rojas, 1996; Bartlett and Anthony, 1999).

This strategy, of course, is based on the hypothesis that mental states are fully characterized by specific activation patterns of brain neurons, where the attribute 'specific' is to be understood in a functional sense. This means that, while the same mental state is not necessarily associated to the activation of the same brain neurons, what matters is that, whatever be the neurons activated, each time, in correspondence to this state, they give rise to the same input-output behavioural patterns of the subject lying in this mental state itself.

Within this functionalist framework the problem arising from the fact that the same mental state is, each time, associated to different patterns of neural activation is avoided by supposing that all these different patterns are characterized, if associated to the same mental state, by a sort of invariant "signature". The latter can be conceived as defined by a set of invariant features characterizing these patterns, and whence also the electromagnetic signals emitted by the brain and detected, for instance, through electroencephalograms (EEG). These features, in principle, could be found through a suitable analysis of the observed EEG. However, as this analysis should, with high probability, be very difficult to implement, the best strategy seems to be the one of collecting the highest number possible of associations between EEG signals and motor outputs, so as to train, through a supervised learning procedure based on known examples, an artificial neural network to produce the output only when the presented EEG corresponds to the intention. Thus, if the learning would be successful, the network weight distribution found after the completion of learning itself, would automatically give an implicit description of the procedure to be used to analyze the EEG signal to extract the 'signature' of the intention.

Without entering into technical details about the implementation of this strategy, widely used to design the actual BCI, we will limit ourselves to remark that it is, in principle, destined to fail, owing to the existence of two main conceptual difficulties. The first one stems from the fact that, given a whatever supervised learning procedure, its performance in the test phase (that is, after completing the initial training phase) depends in a crucial way on the training examples used during the learning. Namely, not only their number must be high enough, but we also need that they are representative of the possible kinds of situations occurring within the whole sample from which training examples themselves have been extracted. Unfortunately, both conditions will never be satisfied in the case of EEG signals (or of whatever other kind of brain signal), first because the number of available data is severely limited (for practical reasons connected to the way through which experiments on human subjects are performed), and, in the second place, because we do not know (and we will never know) how the whole sample of possible EEG is structured. The latter circumstance precludes any possibility of assessing the representatives of chosen training examples, so that, for every supervised learning procedure, we will always be unable to grant its reliability.

However, even if this difficulty could be avoided, we could never overcome the second main conceptual difficulty, arising from the fact that, in principle, mental states cannot be defined only in terms of input-output associations. The number of different possible input-output relationships associated to the intention is virtually unlimited, just because the number of different possible contexts is unlimited. We stress here that the word 'context' includes not only states of the environment, but also the occurrence of other, contemporarily present, mental states. To conclude this section, the previous arguments show that the actual strategy used to design BCI is unsuited to capture the occurrence of intentional states in the minds of subjects. This means that the main goal underlying the

introduction of BCI will never be reached in this way. In the next sections we will explore a possible alternative.

3. Metathought

Before going further, we remark that intentions can be hardly conceived as mental states. Namely the concept itself of mental state is useless when dealing with adaptive mechanisms, such as intentions, which underlie a number of control processes, in turn acting on mental operations, such as reasoning, deciding, recalling, and the like. If we generically denote the whole set of usual mental operations through the word 'thought', we should denote intentions, and other control mechanisms, through the word 'metathought', to stress the fact the latter acts on, controls, and drives the ordinary thought.

Within the history of Psychology the concept of metathought has not been very popular. In the Seventies Flavell introduced an analogous concept under the name 'metacognition' (Flavell, 1976). The study of these kinds of topics has been pursued mostly within the domain of Developmental and Educational Psychology (see, for instance, Weinert and Kluwe. 1987; Crowley *et al.*, 1997). Only in more recent times some authors began to introduce computational models of the operation of prefrontal cortex, considered as the seat of control processes within the brain (Becker and Lim, 2003). Anyway, all metathought processes could be interpreted as aiming to keep some sort of equilibrium or, more in general, of coherence. Therefore, in order to describe metathought and intentions, the problem is to find what are the best models, as regards both the physical basis of these processes and their logical nature.

Of course, the generally adopted solution of this problem consists in resorting to classical physics and to classical logic. Unfortunately both are ruled out by theoretical arguments as well as experimental findings. On the theoretical side, we know from long time that classical physics is not endowed with coherence-keeping mechanisms. The latter are forbidden by Second Principle of Thermodynamics or, what is equivalent, by the so-called Correlation Weakening Principle, stating that whatever long range correlation will die away after a long enough evolution time. On the experimental side, a large number of experiments performed by psychologists evidenced that most mental processes, including semantic memory search, problem solving, reasoning, cannot be described by classical logic, which, rather, appears to be more suited to describe the operations performed on bits within a digital computer (see Adler and Rips, 2008).

On the contrary, Quantum Theory appears as endowed with powerful coherence-keeping mechanisms, whose efficiency is, in rough terms, due to the fact that within it whatever entity is not spatially and temporally localized but rather described by a probability distribution ranging over the whole space-time. Thus, the superposition of different probability distributions associated to different entities gives rise to a sort of long range correlation between these latter which counteracts the disturbing influences produced by heat, noise, and other coherence-destroying mechanisms. Among the coherence phenomena of quantum nature we can quote ferromagnetism, super fluidity, laser effect, superconductivity, and many others. Some of the latter occur only below a very low critical temperature, close to the absolute zero, but others take place even at high temperature.

It is, however, to be remembered that the expression 'Quantum Theory' is too generic. Namely we currently have two different kinds of Quantum Theories: *Quantum Mechanics* (QM), dealing with fixed numbers of particles lying within finite space volumes, and *Quantum Field Theory* (QFT), in which the field strengths are the basic entities, and infinite volumes as well as processes of creation and destruction of particles are possible. While in QM we have a finite number of degrees of freedom, QFT is characterized by an infinite (and continuous) number of degrees of freedom. Both in QM and in QFT the mathematical entities describing physical quantities must fulfil suitable constraints, expressing the non-classical nature of these theories and often

called *canonical commutation relations* (CCR). Once given a physical system, a particular choice of the description of its dynamics, provided it fulfils the CCR, is called a *representation* of the CCR. Now an important theorem of QM, proved many years ago by Von Neumann, states that within it all different representations of the same physical system are unitarily equivalent. This means that in QM all representations of a given physical system have the same *physical content*. However, this no longer true in QFT, as shown already in the Sixties. This circumstance entails that within the latter theory the different descriptions of the same physical system can be unitarily non-equivalent, that is describing *different kinds of physics*. Such a state of affairs occur just when we deal with *phase transitions*, when a given physical system can undergo a transformation from a given phase (for instance solid) to another phase (for instance liquid), the two phases being characterized by entirely different physical properties. This implies that only QFT offers a framework for describing phase transitions (see on these topics Minati and Pessa, 2006, Chap. 5; Pessa, 2008).

These considerations entail that only QFT can describe the emergence of metathought. Such a circumstance is at the basis of a number of *Quantum Brain Theories* (see, for comprehensive overviews, Jibu and Yasue, 1995; Vitiello, 2001; Globus *et al.*, 2004), in turn relying on a firm experimental evidence about the quantum nature of physical phenomena underlying mental processes (Tuszyński, 2006; Abbott *et al.*, 2008). We cannot, however, forget that the same evidence leads us to conclude that normal thought processes should be described by QM, the theory to which QFT is reduced when we are far from phase transitions and the number of components of our systems is kept constant. The quantum logic of mind [Zizzi, PhD thesis] describes a *Quantum Computation* acting on *qubits*, entities consisting in a superposition of two quantum states, conventionally denoted as '0' and '1'. Each qubit can be seen as carrying a sort of implicit double potentiality, which can give rise to an ordinary bit under the action of a projection operator producing a collapse of the qubit state. Thus the normal operation of human mind, in a number of cases, can be viewed as equivalent to the one of a suitable *Quantum Computer* manipulating qubits.

4. Quantum Robots

The previous considerations lead in a natural way to the introduction of the concept of *Quantum Robot* (QR). The latter, first proposed by Benioff (cfr. Benioff, 1998), can be defined as a mobile system which has a quantum computer on board, and any needed ancillary systems. A QR moves in and interacts with the environment of a quantum system. However, the QR originally discussed by Benioff have no awareness of their environment, and do not make decisions or measurements. We can therefore ask ourselves whether in the future it might be that quantum robots will be aware of the environment, and could perform experiments. This means that they might even become self-aware, conscious, and have "free will".

In this regard it is to be taken into account that, in order to endow a QR with these features, it should be equipped with a sort of "internal observer" able both to look at the internal (quantum) computations of the QR itself and to control them. This internal observer thus should act on QR computations through a *Quantum Metalanguage* suited to control a *Quantum Language*, expressed in terms of qubit manipulations. It is natural to suppose that the core of the Quantum Metalanguage consists of inner measurement operators, like the ones used in QM. Unfortunately the latter are not suited to control a QR, as they coincide with projection operators, destroying qubits (which, after the action of a projector, become simple classical bits, whose value is 0 or 1). This entails that traditional "Quantum Logic" would not correctly describe the inner measurements needed by a QR (Zizzi, 2007).

A possible way out of this problem consists in resorting to the so-called "Weak Measurements" (WM), yet introduced by Aharonov *et al*. (see Aharonov *et al*., 1988). Without entering here into technical details, we will limit ourselves to mention that a

WM is based on a measuring apparatus which interacts very weakly with the quantum system to be measured so as to introduce in it only a negligible perturbation. Moreover, after the interaction with the measure apparatus, the latter acts in such a way as to measure (this time in a projective way), not the physical quantity which is the goal of the measure itself, but another different physical quantity, characterizing the system's environment. The result of the latter measure, however, allows to guess the searched value of the physical quantity characterizing the system under study, value which was the true goal of the measurement procedure. A conceptual analysis, which will not be reported here (see Zizzi, 2005; 2006), leads to represent WM through non-hermitian operators, whose eigenvalues (the values of the measured quantities) are given, in general, by complex numbers, with a real and an imaginary part. These operators can be interpreted as describing a quantum system interacting with a *dissipative environment* (see Vitiello, 2001; Pessa, 2008). In this regard we recall that the physical processes occurring within the brain should be dealt with, at least as concerns quantum aspects, through a *Dissipative* QFT, in absence of which the brain dynamics would be characterized by only a single ground state, rather that by the multiplicity of different ground states needed to accommodate the multitude of different memory states necessarily occurring within the brain.

It is to be stressed that a control based on a Quantum Metalanguage made by non-hermitian operators solves in an easy way the problem of the *decoherence* of QR. The latter, as it is well known, is produced by the action of a *thermal environment* destroying the superpositions of quantum states. However, as the non-hermitian operators associated to WM describe an open system interacting with a *dissipative environment* (not coincident with the thermal one), we must take into account that the very existence of qubits results from an entanglement between the system and this environment. Thus, if the states of the dissipative environment are eigenstates of these operators (remember that WM act on the dissipative environment), every thermal perturbation acting on the system will be automatically counteracted by the entanglement of system's eigenstates with the ones of dissipative environment, which will resist against any attempt to entangle the system itself with the thermal environment.

All previous arguments points to an interesting possibility, the one of using the generalized coherent states (eigenstates of non-hermitian operators) of the brain to control a quantum system, for instance a quantum computer based on quantum dots. This would open the way to the implementation of a QC, in which a human subject, through the quantum metalanguage, could drive a QC, through a BCI much more powerful than the actually existing ones, and able to transform in a more effective way human intentions into actions. Such a kind of QC, opening the way to a deeper merging of humans and computers (possible owing to the quantum framework), would, however, require a lot of experiments, and conceptual as well as technological advances. While, in principle, nobody prevents from having a quantum robots, endowed with QFT-based aspects, able to perform inner WM on its own quantum operations, it seems more plausible that the only feasible implementation of a Quantum Metalanguage be the one based on human brain.

5. Conclusions

The previous arguments showed that the quantum approach predicts the possibility of a direct action of mind on matter. This circumstance, beyond the improvement of the operation of existing BCI, opens the possibility of designing new kinds of BCI interfaces. This could cause a revolutionary change in our actual way of thinking, based on the tacit assumption that our thoughts have no direct effects on the world. The concepts of QR and QC, discussed in this paper, could help to orientate the actual research activity on BCI towards this new direction, letting us explore a deeper aspect of mERGERs.

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From the “technological bluff” to building the “cybernetic man”: Which epistemological approach for a better recognition of the physical and cognitive mutations in the relation between the man and the machine?

Olga LODOMBE

The increasing introduction of technology at all the levels of human and social activity, although quite advanced, in particular with the development of the information society, raises more and more questions. At a time when some see in the technical field the means to overcome human limitations and even the possibility of reaching perfection, others see it as a growing threat that must be got rid of at all costs. Faced with this dilemma, a question arises: which future is there for the human in his relationship with technology? In other words, would the introduction of technology in society herald an inexorable development towards the "Cybernetic man" announced by Senator Frank Sérusclat? (Sérusclat, 1995). This dilemma correctly reflects the various epistemological approaches which are expressed in the area of the relationship between technology and society, and more particularly the relation between the man and the machine. From the “technological bluff” (Ellul, 1988) to building a “cybernetic man”, the line seems quite thin. In line with the exponential growth of technology in society, does the ideological battle between technicists and technophobes still have a reason to be?

The purpose of this paper is to propose, starting from an overview of existing approaches, an epistemological approach in the field of the information and communication sciences, which would allow a better recognition of physical and cognitive mutations in the relation between the man and the machine. This will be made across three parts of this communication.

The first part called “technology and society: an empirical question”, will treat the relations between technology and society from an epistemological point of view, across the question of technical innovation. The second part called “at the origin of the notion of “technological bluff”: the speech about the technology” will

mention different theoretical approaches which express themselves in the field of the relation between the man and the machine. The third part called “from the capacity of techniques to the overtaking of human potential: the cybernetic man” will treat the approaches which allow to define the new meanings of the man’s ego and the human being in its relation with the machine. We will conclude by introducing our reflexion on an approach likely to allow a better recognition of physical and cognitive mutations in the relation between the man and the machine.

1. Technology and society: an empirical question

The examination of the controversies which accompany any innovation process shows the narrow interlocking of technical and social contents. According to Blondel: “*the dream which the man chases across innovation is not other than the dream of Prométhée: the man who is the chief of the world*” (Blondel D., 1990). So, the development of techniques can be seen as an activity thought and programmed by the man in its search of the workmanship of the world. This idea consists, according to Akrich, of «*the development of an incorporated scenario of an action plan, program of the sharing out of this action plan in various entities [...] and finally of a representation of the environment in which the action plan can or must come true*» (Akrich, 1993a). Innovation idea mingles so in our minds with that of scientific and technical progress, and this one recalls immediately the science which, since antiquity and especially Renaissance, made postpone the borders of knowledge and enlarged the hold of the man on nature. The advent of the information society registers from this perspective, and its dynamics is anchored in the fact that more or less new technologies are introduced at almost all the levels of human and social activity today. If this novelty, for Jeanneret, acquires three particular dimensions across «*technical novelty*», «*social novelty of manners*» and the «*media novelty of announcements*» (Jeanneret, 2000); the innovation process as for him, is defined as a succession of tests and of transformations where a series of actors (human beings and non-humans / men and machines) are in relation. What implicates a bet not only in relation between the object and its user but especially the development of manners and of practices of the different actors who register in a

particular context. This last is that of the birth of technical innovation, defined by Flichy as a complex process of confrontation, of negotiation which associates many technical actors but also the users. According to him, stakes around innovation impose the installation of a social and technical frame which will allow managing it better (Flichy, 1995). However, if the installation of this last has an influence on the reports with the different actors, for Akrich it can have: «neither purely technical necessities, nor obligation of some sociopolitical forms can explain the form taken by the innovations» (Akrich, 1993b). What leaves the place to concerns linked at the same time to its adoption and its development within the society, and finally transported in different discourses which turn around technical innovation.

2. At the origin of the notion of "technological bluff ": the discourse about the technology

Among the speeches relieved around the technological innovation, they often find a determinist conception which assumes the existence of a unilateral and necessary relation between technology and society. This approach based on a linear relation of causality which goes from the technology to the society, refers to the belief according to which science influences the technology which in its turn has an impact on the society. So, it would exist a kind of transcendence between technology and society which translates relation in a radical way between man and machine, by leaning on the study of consequences which follow from historical events. Also, all the thought of MCLuhan will rest on deep conviction that media, which defines the environment of the man and that of the society, confuses all aspects of life. Their evolution constitutes therefore the main and decisive explicative factor of the human history, where from the famous quotation which is often allocated to him: “The medium is the Message”» (MacLuhan, 1967). In the same way, the purposes of Van der Vleuten participate to reinforce the vision according to which networks contribute not only to manufacture the societies of inside, but are also the triggering factor of drastic transition between modern history centered on Europe and planetary contemporary history. Also they assert: “if we examine the history of the development of the technical wide area networks […] we agree to think that

technical networks have an impact on some social events or even lead them" (Van Der Wleuten, 2001). What gives its entire dimension to the technological paradigm allocated to MacLuhan. It is the same with the researches which register themselves in the determinist approach and support that "identifying characteristics of a dominant medium can then discuss its implications for culture and functioning of society" (Chambat, 1994).

Note that in this approach, taking into account the interaction between man and machine is avoided as the place of social factors in the development of technology. Although it is clearly demanded by its supporters, it appears rather in the form of discourse that reflects the attitude of its representatives. For them, the relationship between technology and society is received in terms of impact. Technology dominates and influences the society in all aspects of daily life and this influence growing calls to deep mutations in the persons. This conception of existent relation between society and technology, between man and machine, leans on "concrete" facts and reveals a technicist speech, qualified as "bluff" by Ellul. According to him, the word "technology", whatever the use of modern media means: "speech on technology", that is to say a speech of subversion and of propaganda which consists of the demonstration of the perfection of the technical objects and their wonderful capacities, a delusive speech which inhibits the man, moves him away from reality and acts as a drug in the society, as much as it "multiplies by hundred the real possibilities of techniques" (Ellul, 1988) while veiling their perverse aspects. This point of view of Ellul leads us to question ourselves about the introduction/presence of the technologies as well as the real capacities of the technological tools in the society. If the word "technology" means "speech on/about technology" as Ellul underlines it, is this speech on technology only menacing for the man? Are we really in logic of alienation which would like us to be as overwhelm by a technological destiny on which nobody can be taken from by now? Are the technological innovations really threatening the balance of the society by taking the place of the man?

A part of these questions settings finds its answers in constructivist conception which postulates that technology is determined by the social reports; it is a socially constructed artifact. On that way, Flichy assumes that various actors

participate in its development. Here, the processes of decisions which determine the technological choices implicate actors, are based on rhetoric and refer to a context. What let's assume that the society influences technology across its choices. The technology in this sense is only an instrument in the service of strategies, a way of translating representations and interests of the actors into presence. This joins the idea of Aitken, according to which a socio-technical system becomes stable after a series of operations of translation, of enlistment, or of profit-sharing leads to the constitution of alliances and/or oppositions between various actors. These last reveals the complex systems with which the society can be compared in its functioning, across the interactions which govern the different elements between those and result of which drives pressures to the training of groups. According to Dubois: "it is also necessary to take nature into account, with his capacity to resist theories [...]; nature must be considered as a social partner like the others. That means the direction of research would always depend in final of the victory of a camp during a conflict of interest without that the nature has systematically the last word." (Dubois, 2001). This last affirmation allows us to wonder about the role that constructivist approach can hold in the improvement of the conception of the relation between man and machine. In other words, in view of the degree of integration of technologies in the society, is the constructivist approach, such as introduced, not a reconstruction of the world by groups oppressed according to their own interests to the detriment of those of the majority? According to Valenduc, the dilemma of determinism and constructivism is neither an academic debate, nor a quarrel of the ancient and the modern, but a stake in debates of society which concern technological changes. So shouldn't we envisage a mediatory approach which would better take into account the different discourses on technology and introduce the relation between the man and the machine under a more promising view?

An alternative in these debates stills in the notion of "co evolution", developed by Manfred Mack. According to him, the co evolution is a "phenomenon which operates at numerous levels and by which parts affect the group which acts on parts itself.". It is a behavior which is in progress and manifests itself by opened and constructive exchanges, likely to produce a

dynamic creator which is, according to him, liberator of treasures of shared intelligence. The same vision is shared by Castells for whom it is obvious that technology does not determine the society anymore, besides than the society defines the course of technical change. According to him, several factors among which the creativeness and the individual entrepreneurship contribute to the scientific discovery, to technical innovation and to their social applications, such that the result at end depends on a set of complex interactions. As a result, “the dilemma of technical determinism is probably a false problem, because the technology *is* the society, and that the society can not be understood or represented without its technical tools”. Mathias abounds in the same sense by maintaining that "daily interaction between the society, more precisely man and technology, must be received in complementarily terms. For him, “it is not really possible to restrain discourse on technology to technical-epistemological circumstances of its development”, as much as this last is linked to the human being and concerns life as a whole. The fact that technologies are present in the society and have an influence in the majority aspects of our daily life does not implicate that we are completely blinded by its phantasm and its informational power. In other words, it is the man who decides of the usage which he makes of technology. The notion of co evolution assumes here to operate strategically choices, by taking into account different elements of the society. It’s only from the interaction between these different elements that the created information will acquire an added value and make easier the organizational emergence which is “the supreme property of the highly complex systems” (Manfred M ack, 1997). So introduced, the idea of a complementarily between man and machine becomes clear, at the same time as it recalls that of the overtaking of human potential by the means of technology.

3. **From the capacity of techniques to the overtaking of human potential: the “cybernetic man”.**

According to the point of view of co evolution from which the technological tools and the society form a complete group, our question is to know how the interactions which result from this group permit today to locate the man in his relation with technology. In other words, can the interactions

which result from the relation between man and machine have an influence on his physical and cognitive system? Can we say that we are moving to a "hybrid" man?

Let us remind here that the idea of studying human mutations facing to the technology is not new. According to Lagauzère, it is already found in the writings of De La Mettrie in the 18th century when the man is compared to a complex machine, impossible to define. From this observation, Lagauzère maintains that “reproducing the real assumes to understand it. As a result, producing an artificial human being assumes to have understood how a "natural" human being works” (Lagauzère, 2008). At this task, cybernetics is going to work across the study of existent interactions inside the living organisms and between these living organisms and the machines. The idea developed by Wiener is that “the society can only be understood across a study of messages and of "facilities" of communication it has; and that, in the future development of these last, messages between the man and the machines, between machines and man, and between the machine and the machine are called to play a continuously increasing role” (Wiener, 1954). Also, the study of the interactions which unfold in the man and that stretch in his relation with the machine would allow us to understand better those who take place in the society across its regulation mechanisms. The term of "machine" returning at the idea of a group composed of interdependent elements and which contribute to the functioning of a whole.

This idea is taken back by the systematic approach which stipulates that to include groups, it is necessary to know not only elements but also their relations and their interactions with the environment. It considers the system like a set of interdependent elements and its method consists in searching solutions on the basis of the observation of a system in its relational network context. This approach is now applied to the domain of information and of communication science across the study of the “communication facts”, defined as “emergent activities” by Mucchielli. According to him, these “communication facts” are from three types: “those that the actors make by regarding the ICT, those whom the actors make by using the ICT, those that the ICT himself issues to the different actors in situation” (Mucchielli, 2006). In other words, to

understand the relation between the man and the machine, it is necessary to analyze it from a bet in situation in a given context, and to examine different types of correlations which take place there. This approach, applied to the facts of communication, allows to include the rules of communication-man scheme and to regulate exchanges better. Such as introduced, it doesn't distance itself from its first conception which is the observation of a system in its context to propose solutions. We point out that this systemic approach gets closer to cybernetics in the sense that it takes into account the notions of interaction and of context with the aim of a regulation of exchanges in the relation between the man and the machine. By doing this it turns to the understanding of the behavior of the human being in his report with the environment and his similar.

Of even, the cognitive sciences which think that the brain is the seat of mechanisms having a level of logical explanation, register themselves in the systematic and the cybernetic logic. According to them, our reflexion can be described by a continuation of logical operations, the human brain working as a computer. So, the cognitiviste psychologist Jerry Fodor postulates that "cognitive faculties would be data processing modules in the same capacity as a robot treats *inputs* and produces *outputs*" (Ayache, 2008). According to him, human thought would appear from interaction between these small units of information. Changeux as for him prefers using the terms of "mental objects" to recall the idea of the transmission of thought in circuits of neurons. That joins the connectionist approach of Denett (Ayache, 2008): ideas are potentially visible objects in networks of neurons and these mental objects think they are permanently put in the middle of a competition which mysteriously looks like a darwinian competition. Since then, the study of the mechanisms of the human brain gives its sense to the new meanings of the ego in the relation between the man and the machine, updating the image of ancient notions such as the interactivity, time/distance and border, ubiquity, autonomy, surfeit of information, etc. which are, according to Franck Sérusclat, characteristics of the cybernetic man. Considering therefore the strong development of technologies in the society and at the present time, can we say that we attained the stadium of the "cybernetic man" announced by Sérusclat?

According to Cathelat, it is possible to consider that there is interactivity since there is relation between two living beings. The interactivity is therefore above all a social function all the more important as interpersonal exchanges are frequent and close. In comparison with modern context: "technological revolution arrives therefore at an instant when a re-emergent interactivity need manifests itself strongly. It is a participation need that touches all domains of life […] and this notion of interactivity more gains in value and procreates a "*true "infostrielle" revolution" (Cathelat, 1998)*. The interactivity leads a revolution of the status of subject and brings a model which contacts the individual first of all. Whatever is the ground on which it practises, it leads to a new way to apprehend the world, where the status of subject is transformed into "*a virtual ego or an interactive ego*". The modern, more and more interactive man is in search of a personal satisfaction which is born from a need of individual, coming participation himself of the frustration due to anonymity, and this need is comparable to the need "to count for something..." . Also, in front of its screen, the body fades progressively to leave place to an "automatic subject" in research of partial and momentary satisfaction. By this way, the modern man or "the cyber-nomad acquires privilege to reorganize the society in his please by choosing with whom he is connected, by composing his address book, by joining a group or by constituting around him a network microphone he creates his family, his tribe, his true village or district" (Cathelat, 1998). The interactivity need characterizes therefore the modern man who searches by this means to free himself from a system which stifles him to head for a more reactive, less restrictive system (in terms of instantaneity) and leaving more intriguing and more interesting for him. According to Cathelat: "if these new possibilities are not although indeed vital, they entice every day a little more because true revolution resides in the feeling of freedom, infinite choice, of opening in the world which gives new technology, and it is an overdrive of the potential of life of each in a virtual world which is received unlimited and without restrictions" (Cathelat, 1998). The modern man is meant to be not only unlimited and without restrictions, but to be especially capable to recreate his world and to evolve inside as he wants. New capacities which he develops across his relation with the machine.

Also, the notions of "time", "quickness" and "border" are also characteristic of signification of the ego of the modern man. Carrying a look on the society in his time, Max Weber identifies a main risk of loss of the sense which the individual can give to social activity and to activation of his clean will, under the influence of a rise of process of domination. According to him, these last are not only carried by modern forms of legitimization but tend to mechanize and to dehumanize the modeling of individual behaviors. This reality would be already strongly registered in the course of the development of Western civilization. In the same optics, when Blay maintains that “the modern man devoted himself, with delight and sometimes dread, in the worship of quickness” (Blay, 2002), it is to include better the report of the man in time in the modern world and to wonder about the future of this being in the world of the quickness as the world of life. Zarifian as for him, prefers speaking about “time – become”, and he presents it as the social symbol of the productiveness of work and thereby a stake of the modern world. As a result: “no society can indeed lose interest of the way its members devote time to produce their conditions of existence and of the power of effects of this "how" ” (Zarafian, 2001).

On the other hand, Weissberg tries to explain the cultural impact of new technology on the man by using the terms of "remote presences" (Weissberg, 2000). According to him, the fact of being available at the same time in the real life and via the technologies has an influence on the social reports of the beings and a double relation system is established. Negroponte abounds in this sense by maintaining that “the more we will become numerical, the more obstacles risk to be physical and not electronic” (Negroponte, 1995). Nonetheless, these areas, for Weissberg, are not retorts of the real because it is not indeed possible to retort virtually what is possible in the real. The purpose of Negroponte brings a nuance in this reasoning, by supporting that the concept of "virtual reality" is a verbose concept as much as “the virtual reality can make artificial as realistic, or even more, than the real”. The virtual reality allows so to live a situation with its own body, the basic concept being to give the feeling “to be there” and it is therefore this feeling of ubiquity that the man develops in his relation with the machine. There are many other characteristics of the modern man such as autonomy and overload of information that we did not name in this work.

To conclude, we will remind that the thread of this work is a question setting on a possible

epistemological approach for a better recognition of the physical and cognitive mutations in the relation between the man and the machine. The approaches which were introduced have all their reasons to be and we will say with Valenduc that they constitute another stake in debates of society which concern technological changes. However, their examination allows us to maintain that the most interesting approach is the one which considers firstly that the innovation process is socially constructed, which takes into account the notion of co-evolution, which considers different actors, their context, interactions that they cause as well as different influence that they can have some on others. This approach is offered by Mucchielli across the study of the "facts of communication" (Mucchielli, 2006) considered to be exchanges in which the sent messages have a signification necessarily in comparison with a collective situation including the actors concerned by exchange. It is about a communicational approach of ITC.

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On Psychic Development in the IT Environments

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Abstract

Technology-rich environments provide means for either psychic (mostly cognitive) development or stagnation. Lifelong learning to apply new IT services, gadgets, software, etc. is a good chance to enrich one's psychic capabilities. Nowadays adolescents include the parameter of familiarity and expertise with the new technologies into their self-assessment status.

The thesis that the IT environments provide a potential for human mental growth and psychic development is totally consistent with the Vygotsky's cultural-historical theory of psychic development. The main reason is that Vygotsky stressed the importance of semiotic systems in human development. IT environments consist of hardware and software units, both made of sign systems: binary digits are combined in enormously complex combinations according to numerous logical steps, and the combinations include not only particular computers but also computer networks, technology control systems, Internet and Intranet, etc. Thus, the IT environments are semiotic environments.

The most advanced technologies provide the means for psychic development; what is important, the technologies should provide the ways to keep learning new issues: for example in CAVE-like immersive environments the human beings need to seek information, to grab it out of the environment instead of getting the full account about the environment collected and presented by virtual agents. Mental stagnation is traceable when humans cease getting new pieces of knowledge; aside from cognitive "decay," humans may feel disinterested when perform repetitive action. This can be proved by our studies of the computer hackers' motivation, held within the positive psychology framework.

Finally, lifelong learning and usage of the IT units should have its limits. Addiction to the new IT environments – although it is very likely different from the traditional psychological dependencies – presents many reasons to feel anxiety. Addiction may mimetically follow some seemingly novel ways of the IT use, which should be differentiated from purely creative work in the new environments.

In the paper several psychological theories such as Vygotsky's cultural-historical theory, Piaget's epistemology and Csikszentmihalyi' flow experience (belonging to the positive psychology) will be paralleled in the context of the IT technologies usage.

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