Integrated, threaded and distributed cognition: a brief discussion of cognitive models in cyberculture[1]

Cognição integrada, encadeada e distribuída: breve discussão dos modelos cognitivos na cibercultura

Cognición integrada, encadenada y distribuida: breve discusión de los modelos cognitivos en la cibercultura

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Abstract *Recently the role of cognitive processes in cyberculture has regained focus. The studies about transformations in contemporary media point to the fact that communication and entertainment practices demand the use of several abilities of cognitive nature. We aim to contribute to these studies by*

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formulating a mapping of three contemporary cognitive models, able to provide a basis for cyberculture communication practices: integrated cognition, threaded cognition and distributed cognition.
Keywords: *Cognitive models. Attention. Communication practices.*

Resumo *Recentemente ressurge o interesse sobre o papel dos processos cognitivos na cibercultura. Os estudos sobre as transformações nos sistemas de mídias apontam que práticas comunicativas e de entretenimento demandam o uso de diversas habilidades de caráter cognitivo. O objetivo é contribuir com esses estudos, elaborando um mapeamento de três modelos cognitivos contemporâneos, capaz de embasar as práticas de comunicação da cibercultura: cognição integrada, cognição encadeada e cognição distribuída.*
Palavras-chave: *Modelos cognitivos. Atenção. Práticas de comunicação.*

Resumen *Recientemente ha resurgido el interés sobre el papel de los procesos cognitivos en la cibercultura. Los estudios sobre las transformaciones en los sistemas de los medios de comunicación señalan que las prácticas comunicativas y de entretenimiento exigen el uso de diversas habilidades de carácter cognitivo. El objetivo es contribuir a esos estudios, con la elaboración de un mapa de tres modelos cognitivos contemporáneos, capaz de justificar las prácticas de comunicación de la cibercultura: cognición integrada, cognición encadenada y cognición distribuida.*
Palabras-clave: *Modelos Cognitivos. Atención. Prácticas de Comunicación.*

Introduction

Recently, the interest in the role of the cognitive processes in cyber-culture has regained focus in the frame of the debate about the transformations in the contemporary media and entertainment systems, as Brazilians´ and foreigners´ researches demonstrate it. (AARSETH, 1999; JOHNSON, 2001; LEMOS, 2002; SANTAELLA, 2003; GEE, 2004; SÁ, 2006; ANDERSON, 2006; ANTOUN & PECINI, 2007; PRIMO, 2007; FRAGOSO, 2008; JENKINS, 2008; RECUERO, 2009, to cite only some of them). Among the changes the authors discuss we selected those which imply challenges for the users´ cognitive processes: 1) Greater participation in activities of collaborative content construction and in social interaction environments; 2) Increase in the quantity of information distributed over diverse platforms, requiring that the user acts as a real investigator: an accurate selective perception is necessary in order to explore, select and connect the contents of interest in the midst of abundance and fragmentation; 3) Necessity to select tasks and order them due to the stimuli and demand overload; 4) Finally, the stimulus to learn various languages, software and mediatic codes that are essential in the digital culture.

The purpose of this article is to contribute to the studies mentioned above by elaborating a mapping of three cognitive models, able to provide the basis for the communication and entertainment practices resulting from the current transformations. Therefore this text will correlate some digital culture practices with models of cognitive processes developed by researchers of domains such as cognitive sciences, neurosciences and cognitive psychology The models are: **integrated cognition** (definition created for the processes described by CLARK, 2001), **threaded cognition** (developed by SALVUCCI & TAATGEN, 2011) and **distributed cognition** (developed by HUTCHINS, 1995; 2001).

Continuing the discussions about the concept of cognition, we will use the term "amplified" cognition (REGIS, 2010; REGIS *et al.*, 2010) to refer to the broad repertoire of abilities (sensory-motor, perceptive,

emotional and social)[5] which the communicative practices require. It is the idea that, in order to know the world and act in it, the mind uses the body, the environment, technical objects and social interactions. In this context, the technical devices are no mere tools or extensions of human abilities, but they reconfigure the cognitive process in a dynamic and complex way (HUTCHINS, 1996; NORMAN, 1993; CLARK, 2001; BRUNO, 2002; BRUNO E VAZ, 2002; LATOUR, 2005).

We will now briefly develop the cognitive models that are present in cyberculture and the practices that are associated with them.

Integrated Cognition

With the structure of hyperlinks and hypermedia, the internet accustomed us to reading and to the search for fragmented information. We deal daily with segmented contents and information and in excessive quantities. We live surrounded by gadgets (iPads, iPods, cell phones, netbooks, radio sets, television sets among others) which vibrate and emit lights and sounds, fighting for our attention. In this context of task excess, the overload of meanings and the great urgency to make decisions raise questions such as: *how does our perception act when facing the excess of stimuli? How do we decide with which stimuli/tasks we will deal?* They bring to the surface the interest in the relationship between **perception** and **action**.

Relationship perception action yesterday and today

The model of the relationship perception-action which predominated from the 19th century to the middle of the 20th century is the well

[5] For a discussion on the articulations between body and communication technologies in their diverse dimensions (sensory, affective, social, etc.) Cf. BRUNO 2002; REGIS, 2002; SIBILIA, 2003; SÁ, 2004; PEREIRA, 2008.

known cycle of "feel-think-act". According to this model, the perceptive system provides minute information (entry data) for the production of a detailed representation of the scene (surrounding environment) which will be analysed by the brain (decision making centre), for decision making. The following step consists in the transmission of the decisions by the brain to the motor system which acts independently of the perceptive system. This model seems to be substituted by the idea that perception is influenced by multiple agents and integrated into the action. Thus perception, thought and action act simultaneously and in an integrated way

The integrated cognition model understands that perception is interconnected with possibilities for the action and it is continuously influenced by inner factors (sensations, emotions, intentions, memory and motor apparatus) and by outer factors (material and contextual ones) (Cf. CLARK, 2001, p. 95). One example helps to clarify this issue, Clark (2001, p. 91) cites an experiment in which people watch pictures that are shown on a computer screen. While the eyes of the people under study change direction, changes are made on the scene. Clark explains that great changes, such as to replace a tree by a shrub or to add a car, are not perceived by the people under study. The reason therefore is that the visual system does not work in a way to construct a detailed model of the scene, but it is concerned with searching and retaining information for the time in which it would be necessary such as, for example, to resolve a problem. The people perceive the scene in a different way, according to the task they have in mind (*Idem*). This means that the perceptive system is mainly selective and searches for information in the environment for immediate or later use. How do we choose data for a later use? With the basis on his story and his context, each individual selects data which are associated with a cognitive domain (mental model) he already possesses. The Russian thinker Lev Vigotsky explains that a crucial aspect of perception is what he calls *perception of real objects*:

> The world is not merely seen in colour and shape, but also as a world with meaning and signification. We do not merely see something round and black with two clock hands: we see the clock and we can distinguish one hand from the other. (2007, p. 24).

The researcher Jean-Pierre Changeux (1991), for his part, believes that the brain develops strategies for the recognition of the shapes in an autonomous and social way. According to the author, there is a direct relationship between the materiality of the objects and their particular mental creation in the individual´s memory, as a form of self-organization of the thought (Cf. 1991, p.136-7). He calls mental picture the inner vision which appears when somebody refers to an object and a picture immediately appears in our minds, such as, for example, when we refer to Leonardo da Vinci´s Monalisa, after having seen the painting in the Louvre or its reproduction in a daily situation.

The integrated cognition model seems also to be compatible with Jean Piaget´s constructivist thesis. The thinker proposes that knowledge constructs itself through action and that the latter engenders mental models (schemes) in the subject:

> **No knowledge is only due to perceptions, because they are always directed and framed by action schemes.** Knowledge arises from the action and every action which is repeated or generalized by the application to new objects engenders therefore a <scheme>, that is to say a kind of praxical concept (1985, p. 51 – we underline).

As Piaget already foresees, the products of the perceptive activity are not neutral descriptions of the external reality. Instead of this, they constitute "recipes for action and intervention" (CLARK, 2001, p. 93). For example, when we want to reach a fruit which is on a table, we need not make a detailed representation of the environment around the fruit to plan the trajectory. We must only focus on the fruit and on the way to reach it. The perceptive system traces an "inner map" of the trajectory

between us and the fruit, transforming the visual data into "recipes for action and intervention".

For the integrated cognition model, attention is a fundamental factor, because it works as a source of selection and orientation of the perception/action process in the environment.

Importance of selective attention
for the integrated cognition

In 1890, William James defined attention as something which "implies to deprive oneself of some things in order to be able to deal with others in an efficacious way. This condition is the complete opposite of the confused, dazzled and distracted state which the French call *distraction* and the Germans *Zerstreutheit*" (1981, p. 381-382). In a similar way, Jonathan Crary defines attention as the capacity to "disconnect oneself from a broader field of attraction, be it visual or auditory, in order to isolate oneself or to focus on a reduced number of stimuli" (CRARY, 2001, p.1).

These two definitions help to understand the historical context of the appearance of the interest in the nature and functioning of attention[6]. In the middle of the 19th century, experiments on the modes of human perception evidenced that each individual produces his own perceptive synthesis (Cf. CRARY, 2001, 2004; WICKENS &McCARLEY, 2008). These results disqualified the *a priori* Kantian faculties as guarantees of the objective perception of reality (of the "phenomenon") and of the creation of true knowledge. Thus the problem of 'maintenance of reality' stopped being a transcendental question and started depending on a contingent, psychological, experience-anchored faculty of synthesis (Cf. CRARY, 2004, p. 69). In this context, attention is a founding element because it is it that selects the stimuli and/or the information

[6] According to Crary (2001; 2004), two aspects provoked the interest in attention in the period: the questions associated with the "neurological conception" of modernity (Cf. SINGER, 2004) and with the "problem of the maintenance of reality" (Cf. CRARY, 2001; 2004 e MATURANA, 2001).

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which must be focused. Thus it is the glue which amalgamates the real world against the sensory and cognitive collapses, conferring perceptive unity on the external reality.

Wickens and McCarley approach various kinds of attention. The attention, this text is interested in, is the selective attention understood as the option to dedicate oneself to a determined task confronted with other stimuli or distraction factors (2008, p. 2). Wickens´ and McCarley´s selective attention maintains a certain proximity to Thomas Davenport´ s and John Beck´ s models of **attractive**, **aversive**, **voluntary and captured** attention (2001, p. 22-3). In the voluntary attention as well as in the attractive one, the personal life experiences serve as filters, agents that permit to select among the excess of stimuli and information of the environment those which are interesting for the production of a recipe for each individual´ s particular action and intervention.

We believe that the understanding of the perceptive system as well as that which creates "recipes for action "can be the basis of the cyberculture practices which stimulate an intervention posture on the user´ s part Let us see now how integrated cognition can be the basis of some cybercultural activities.

In our daily life, the most banal communication and entertainment practices, such as "navigating" the internet, seeking telephone numbers on the agenda of the cell phone, playing videogame, watching a TV series, posting messages on a blog imply processes of **search, exploration** and **connection** of contents. All these activities are supported by the attention process and by the integration between the perceptive and motor systems.

The **content** and **information seeking** activities are present in various online tasks: we seek on all kinds of sites (journalism, sales, film trailer propagation, etc.), on blogs, on social networking software, searching for friends, and in various other online activities. In these actions it is the existence of a previous **mental model** and of **selective attention** which permits to focus on the content (icon, tag, sound, vibration) we need to find the information we wish or to resolve a problem.

There are activities in which we must **explore environments** (cell phone interfaces and tablets, websites) in order to discover a functionality of the equipment and/or scrutinize scenarios (videogames) in order to find functions or an objective which has not been explained at the beginning of the game or a hidden object[7]. For the exploration of environments, in videogames or in gadget interfaces, selective attention and perception integrated into the action permit to intervene: to focus on/ to click on an icon, a sound, word which works like a link in order to achieve an objective or an information search.

A third practice which, according to us, can be based upon integrated cognition is the capacity to identify quotations in culture and entertainment products. In *Introduçao à Semanálise* (1974) [English title: *Desire in Language: A Semiotic Approach to Literature and Art*], Julia Kristeva introduces the term intertextuality by means of a reading of Bakhtin´s work, based upon the basic ideas of dialogism and ambivalence (polyphony). *Intertextuality* is understood as an infinite possibility of a meaning interchange between the work and the spectators. Umberto Eco adds: capacity of the media product (book, film, videogame. etc.) to quote directly or indirectly by means of repetition, paraphrase or any other resource, the scene of a film, a passage of a literary work, a musical phrase (ECO, 1989, p. 124-126). To previously know the quotations is a challenge the individual has to face in order to succeed in having access to decoding possibilities. Eco calls this previous repertoire "intertextual encyclopaedia". This encyclopaedia seems to be comprised of Changeux´s mental models (or Piaget´s schemes) which will provide the basis for the perceptive system (attention) to select the data in the environment. In the activities in which we must capture the "hidden information", it is the previous mental scheme which permits to separate a "figure from a background" in a scenario. It is necessary to have a mental picture of the product which is being quoted in order to make the association.

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[7] The exploration of environments seems to adhere to Aarseth´s notion of cybertexts (Cf. 1997, Introduction).

Another practice which is supported by our capacity to **connect contents** is to watch trans-media narratives. In this kind of narrative, the content of a work is distributed over distinct media. The role to investigate and reunite information that is dispersed on different platforms is incumbent on the user. For example, the TV series *Heroes* was planned in such a way that the spectator, besides watching the series episodes, seeks complementary contents in comics, sites, games and other media. In theses activities the way in which every individual assimilates a possible scenario among so many possibilities of content interpretations and associations is obvious. It is an example of the way in which attention is essential for the perceptive system in its task of permitting the attachment of fragments and the synthesis of the information of the world in a more dynamic way, what Davenport and Beck believe to be a more interesting way to draw attention, by means of the production of a broader, less predictable and more participative content (Cf. 2001, p. 80).

The integrated cognition model can still be observed in the practice of videogames. In wrestling matches, for example, when we observe a player in action, it is possible to note that, by perceiving the "entrance into the match" of a "villainous" character, his attitude is not to stop in order to analyse who is the character, what is his physical constitution or his powers in order to make the decision only afterwards about the way to defeat him and finally start acting. What we visualise is an example of interaction between perception and action: the player´ s motor apparatus begins to act much before the sensory signs reach the more complex cognitive levels. The player´ s initial perceptive processing (sight and other peripheral signs), by capturing the opponent´ s presence, generates a kind of "proto-analysis of the scene" (CLARK, 2001, p. 95), enabling the player to select actions (such as to move his head or his eyes, to press buttons and/or to move the joystick) in order to already provide a sensory sign slightly improved, directed to the opponent´ s defeat before being hit by him.

We believe that the property of selective attention to choose the contents of interest in the midst of abundance and entertainment in cyber-

culture resides in this capacity of integration between the perceptive and motor systems, with the ensuing production of recipes for action. It is the actuation of integrated cognition which permits to synthesize stimuli, to attach fragments and to confer unity on the experience nowadays.

Threaded cognition

People daily experience the excess of stimuli and of multi-task functions, be it daily activities, like to sing while having a shower and at the same time to think about the activities of the day or to chat while driving, being guided by a GPS, alternating with a call on the cell phone. But the internet and the TIC potentialize the multiple activities, in the same way in which the communicational and socio-cultural practices were modified with cyberculture. This phenomenon affected other sectors, as we can note in the dismissal policy of the companies (in the function reduction, in the requirement of a more and more multi-functional professional, in the number of workers who accumulate tasks carried out before by more than one person).

We are interested here in the appropriations of the multi-task in cyberculture such as, for example, in the current habits of developing activities with numerous open internet windows on the computer, alternating programmes such as chats via *MSN* or answering an email, visiting social networks such as *Twitter, Facebook, Orkut*, or executing entertainment activities (to download a film, to listen to the discography of one´s favourite singer, to watch the more commented video of *You Tube* of the week and to play games on the net with some friends).

Thus the second type of cognition which involves this relationship and which must be taken into consideration is the threaded cognition, classification of the authors Salvucci and Taatgen, in *The Multitasking Mind* (2011). The researchers explain that threaded cognition works like a cognitive net on which the activities that use different cognitive functions act like independent lines (threads) of thought which

come to the mind, resulting in the multi-task behaviour. When the user watches a film on the computer (connected to the internet) and the alert of a new message rings on *MSN*, at the same time in which he imagines who is calling him, he produces a motor action (movement for the switching between the windows). The independence of the threads with different cognitive functions is fundamental for the performance of the multi-task activity. The more threads he succeeds in connecting, the more simultaneous is the task (Cf. SALVUCCI & TAATGEN, 2011, p. 7).

Recent researches point out that this fragmentation around numerous activities provokes a constant deviation from the attention, since the time interval spent in the switching between one and the other task becomes shorter and shorter. Thus there is a change in the habits: passing from interval of many hours and minutes of a former society model to intervals of some seconds in the present time. The tasks become more and more simultaneous and the interruptions become shorter and shorter.

According to North-American researches, the average time spent by an employee in office activities is only three minutes per task before he dedicates himself to a new focus. In spite of this, half of these tasks represent external interruptions, such as the telephone ringing or the arrival of an email and the other half represents the personal initiative of tasks, including a call on the cell phone or leaving the desk (*Idem*, p. 4).

Among these so common daily activities in the culture of the 00 generation, it is important to emphasize the function of the behaviour of attention in threading functions as well as the problems which arise, such as fragmentation and attention deficit (distraction) due to multiple focuses and to automated activities. It is common that this type of threaded cognition collides with some functions of integrated cognition, when the chosen order for the execution of an activity or the focus of the attention is being discussed.

From the concurrent tasks to the simultaneous tasks

The necessities of contemporary life oblige us to divide the attention between diverse activities. The threaded cognition points out the following states of the multitask behaviour: **concurrent multitasks** and **simultaneous multitasks**. The first (*attention switch*) refers to the actions which cannot be performed at the same time, making necessary the switch from one system to the other (it is difficult to drive, answer the cell phone, switch to another broadcast station, and navigate on the GPS at the same time since all the functions first use the hands besides other abilities). These tasks must be performed sequentially – switching from one activity to the other. In order to explain the first case, the neuroscientist Jean Pierre Changeux (1991) relates that the switch from perception to attention is due to the perception time necessary for the composition and crossing with a mental picture already constructed in the thought, in the memory.

Perception needs a real picture, such as, for example, the shape of an ambiguous picture, which can represent a glass of champagne with a cherry on top of it as well as a topless bikini and a navel, depending on the load of different meaning attributed to the same picture (Cf. CHANGEUX, 1991, p. 137-8).

This example explains a picture competition, the switch from one meaning to another, which can never be simultaneous, because it involves distinct meanings. It is easy to perceive the conflict with information of the same order when, for example, it is difficult to remember a song when we are listening to another one at the same time. Thus in order to have a multitask mind we must use distinct abilities, some being already automated.

The **simultaneous multitasks** deal with the activities, which involve differentiated sense organs, it is easier to execute them simultaneously (such as to speak and to drive, to press the joystick buttons of the videogame and to chat on the net with the players). In the activities of simultaneous multitask it is easier to lose the attention focus. Jonathan

Crary suggests that the present culture is based upon characteristics of attention deficit (Cf. 2001, p. 36). Davenport & Beck emphasize two challenges in the attention equation: "1) how to conquer and maintain somebody´s attention and 2) how to divide one´s own attention between diverse parts" (DAVENPORT & BECK, 2001, p. 3). Facing these challenges has been one of the great problems in the domains of education, social relationships, labour and consumption.

But the authors Salvucci and Taatgen consider that, on the other hand, multitask has an important function, mainly for the work of specific areas, such as that of physicians (who must divide their attention between numerous differentiated cases of their patients). Nonetheless a relationship which must be stressed in the present mental models is the question of autonomy of tasks.

The researchers Davenport and Beck (2001) reveal that, when a piece of information is new in terms of motor learning or coordination, the attention remains in a zone called *front-of-mind* (as if it were a temporary RAM memory which still takes some time to be automated). With time passing, the practice of a determined activity makes this memory go to another field of attention: the *back-of-mind*, which corresponds to the activities we perform automatically, without capturing our conscious attention. An example of this is the situation in which a person is learning to play the piano and the movements with the keys are taught together with the sounds, in a gradual way. With the ability acquired in the course of time and the automation of the movements of the two hands, the degree of complexity is increasing. The same thing occurs in cyberculture, when a user, while playing videogame, in which the combination of the joystick buttons has varied functions, firstly he will not succeed in focusing on all the details and he will execute the basic function to switch from one stage to the other by means of the tentative method (errors and lucky hits). Later, when he has already automated the function and possesses greater ability, the player´s attention will already be focused on other activities which give him a bonus.

With regard to abilities and to attention, we note that the learning process of the software, of the computer language, games, sensory abili-

ties required for the game practices and for the interaction via digital TV subscription is easier when the same resource basis is being used on diverse platforms. In an analysis of the Windows graphical interfaces PERANI (2008), proves that the icons of the tools remain the same, so that it facilitates the user´s understanding and usability. Still in the focus of attention, the ludic elements turn to be fundamental for the composition of the aesthetical structures and for the functioning, because they draw the user´s attention in a pleasant way.

Distributed Cognition

The concept of distributed cognition was proposed by Edwin Hutchins (1995; 2000) and has been elaborated by other researchers, such as Donald Norman (1993) and Andy Clark (2001). Hutchins investigates the cultural nature of the cognitive process and emphasizes the dynamic interaction between material, social and environmental factors.

Within this vision, cognition is inseparable from the interaction and action with the world acting in a contextualized and concrete way. Thus it is possible to observe that it benefits from the interaction between humans and non-humans. That is to say it deals with the idea that knowledge production is not centred on a unique individual, but on the interaction between individuals and tools that are present in the environment in which he lives and which help him in the knowledge production in a collaborative way. Therefore we can say that sharing and collaborating help in the cognitive development as well as in the cultural one.

Donald Norman (1993, p. 146), synthetizes the factors which contribute to the accomplishment of the cognitive process:

> People operate like a kind of distributed intelligence in which a great part of our intelligent behaviour results from the interaction of mental processes with the objects and restrictions of the world and in which a lot of behaviours occur by means of a cooperative process with other people.

For this reason, the motto of the distributed cognition model will be given by the common practices in cyberculture, but not exclusively of that one, exemplified by the sharing and collaboration in knowledge formation. The researcher Andy Clark affirms that in order to understand the singularity of thought and of human reason it is important to understand that cognition does not only include the brain, the body and the natural world, but also, what is denominated cognitive technologies, composed of "devices and resources, such a pens and papers, PCs and institutions, on the basis of which one learns, develops and operates" (2001, p. 141).

In the book *A hora da geração digital* [English title: *Grown up Digital*], the author Don Tapscott affirms that "the young people of the Internet Generation are natural collaborators" (2010, p. 110) and he adds saying that:

> They collaborate online in chat groups, play videogames with various participants, use e-mail and share files for school, work or simply for entertainment [...] They take a collaboration culture to their work and to the market and they feel at ease using new tools online in order to communicate (*Idem*).

Basing our discussion on the collaborative sharing and construction of knowledge, by means of the net *wiki*, p2p, social networks, comment forums or nets (about films, series, games, etc.), tutorial videos on *You Tube*, we will show practical examples of the distributed cognition model on cyberculture.

In order to begin the discussions about collaboration we will cite the videogame players´ activities who search for solutions to pass a phase on the internet. In games such as *God of War III, Dante's Inferno, New Super Mario Bros.*, among others, besides the basic task to achieve all the proposed objectives, the players must find bonuses which confer upgrades on the weapons or liberate trophies. But it is not always easy to pass from one stage to the other or even to find such objects. There are

obstacles in which some players, after *n* attempts, succumb to the search for tutorial on forums or on videos of *You Tube*. Nevertheless it is worth pointing out that, on the other hand, there are players who succeeded in passing and they were disposed to relate or even to film the action so that others had the possibility to evolve more rapidly in the game.

A good example of collaborative work on the net is the documentary *Life in a Day*, 2011, by Kevin Macdonald which was created by means of thousands of shared videos. On July 24th 2010, "people from all over the world sent videos about their lives in order to participate in the project, a historical cinematographic experience to create a documentary about a unique day on Earth"[8]. This initiative depicts what Tapscott said about the young people of the internet generation who are natural collaborators.

Something, which is not necessarily a novelty, is the tool "wiki", the *Wikipedia*[9], launched in 2001, it is a collaborative encyclopaedia in various languages, in which each individual, specialist or not, can include and change contents. Still on the "wiki" line" there is the manual of "how to do", called *Wikihow*[10], which through collaboration teaches how to become a *freelance* writer or how to end a discussion without any great problems, for example. But not only on wiki we find information which helps to do something. It is possible to search for a little bit of everything on Google in order to find the piece of information you wish distributed on *blogs*, *vlogs*, social networks and sites.

Sharing is a contemporary tendency, as it is the case of the net p2p. By means of this tendency it is possible to share songs, programmes, videos, series, films, among so may others. Another way of sharing is effectuated through a new usage which is being given to the social networks tools. An example of this are the communities of Orkut, in which the users make available links for downloads of series, programmes, comics, classical music and other products.

[8] Available on: http://www.youtube.com/lifeinaday. Access on: December 20 h 2011.

[9] Available on: http://www.wikipedia.org/. Access on: December 20 h 2011.

[10] Available on: http://www.wikihow.com/Main-Page. Access on: December 20 h 2011.

These dynamics well explain the meaning of distributed cognition by demonstrating that cognition is a process shared by individuals, social groups and technological devices. As Fernanda Bruno emphasizes it "technologies do not operate a broadening, but a transformation of cognition" (2002, p. 2). Therefore we can affirm that this change of the cognitive system has developed and created something which would not be possible in such proportions without the interaction generated by the internet. Alex Primo refers to Piaget to affirm that "human knowledge is collective and 'social life´ constitutes one of the essential factors of the formation and growth of knowledge'" (2007, p. 93-94).

Final Considerations

In this work we attempt to discuss the way in which the TIC, by stimulating the users´ participation, the learning of interfaces and mediatic codes and the social interaction technologically mediated challenges our mental apparatuses, raising the discussion of more complex cognitive models.

The cognition models we studied – integrated, threaded and distributed, - seem to demonstrate that the contemporary practices require that the user be expert in distinct abilities, which are reduced to logical, mathematical and linguistic abilities. Cognition uses "inferior substrates". Factors such as feeling, memory and sociability act in the way in which the perceptive system selects our focus of attention. This is why some authors, such as Davenport & Beck, defend that, "in order to be successful in the present economy, you must be good at conquering the attention!! (2001, p. 3).

Another important consideration of the discussion we propose here is the idea that knowledge construction is a collective production, anchored in the experienced context, in a distributed way, which considers the social interactions of the environment and of the technical objects not only as a tool´ s role. Cognition seems to act in order to produce an

action, to intervene in the world, as Piaget reveals it or as it is shown in recent researches carried out by Javier Echeverría (s/d), who suggests that we think the TIC more as means of action than as sources of information and/or communication.

Finally we approach the question of the excess of stimuli, of fragmentation and of multitasking activities. We saw the importance of attention and of its automation for the performance of multiple or alternated activities. It seems that there is a modification of the socio-cultural habits, since, as SARTORI (2010) relates, there is a process of "distracted learning", which is due to the simultaneous intercourse of non-scholastic languages, which challenge education. The intervention of the new technologies of cyberculture provokes new perceptions and habits (such as the example of the pupil who is doing his homework while watching TV and being connected to the internet). Thus, according to the author, the use of the TIC resources in the learning process must serve as an attractive means for a habit which has already been formed by the new generations in the entertainment practices.

Nonetheless the discussions about the models and the cognitive nature of cyberculture are still recent. It is necessary to produce investigations which deepen these questions in order to verify if the practices of digital culture can be the basis of the reinvention of the perceptive experience, in a similar line to Crary´s discussions (2001), or if we are living an experience of such an erosion of the attention which would lead us to the Middle Ages, as Maggie Jackson suggests it in *Distracted* (2008).

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