Information Technology in the Internet Era: Critical Theory Perspective

Full Paper

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Abstract

The discussion brought by the critical theory philosophers, such as Theodor Adorno and Max Horkheimer, and more recently Andrew Feenberg, leads to wide-ranging questions about contemporary technologies. The contemporary investigation should be on whether the only form of reasoning is the scientific and technological, or there may be non-technical forms of reasoning applicable to social issues and day-to-day problems. Is it possible for the average individual (not an expert in technical terms) to decide or control the technology, in whose design he does not participate directly? The goal of this paper is to contribute to the discussion about the Philosophy of Technology presenting two possible perspectives of Critical Theory. The specific case of Information Systems coding through Social Networks is analyzed from the perspective of these authors, and a practical approach is presented.

Keywords

Philosophy of Technology, Critical Theory, Philosophy of Information Systems, Social Networks.

Introduction

The Greek origin of the term technology is the words τεχνη ("art, technique or craft") and λογια ("set of knowledge"). It is formerly used to define knowledge that allows constructing objects and modifying the environment, in order to satisfy human needs or improve living conditions. Bunge (1985) emphasizes the deliberate characteristic of the technical invention, which is reinforced in technology, and presupposes the methodical design, planning, and implementation of an artifact to be produced in the light of scientific knowledge or, briefly: "the scientific study of the artificial". However, because of its practical purpose, the technologists usually outline and simplify the field in which they operate.

According to Dusek (2006), the Philosophy of Technology is a relatively recent discipline. Although some philosophers (such as Heidegger and Ortega y Gasset, among others) have discussed issues about technique and technology, most philosophers have addressed the issue of scientific knowledge and not of technology itself. Dusek (2006) also states that the Philosophy of Technology involves the interaction between several fields of knowledge, such as science, technology, society, politics, history, anthropology, and ethics. As well, there are different philosophical reflections on technology, but despite it, a concern persists: the efficiency, which relates to the human motivations, development, scope and consequences.

Many questions related to technology are relevant to Philosophy. To focus on some of them, we must understand the arguments of some philosophers and how this field has been studied. When analyzing technological artifacts, critical questions should be formulated: "Do artifacts have underlying strategies?"; "Do artifacts imply certain organization of power and authority?" On one hand, Mumford (1970) claimed the thesis that the technical activity inherent to human life has been gradually subordinated to social and political devices, products of the subjugation of the human masses to the elites’ power. In contrast, the philosophers of the Frankfurt School were critical of the way in which industrial society with a scientific-technological base constitutes a vast system of domination of man by man.

The discussion raised by the critical theory philosophers, such as Adorno and Horkheimer, Marcuse; and more recently Feenberg, leads to a broad questioning. Yet, another investigation to be raised is whether the only form of rigorous and useful reasoning is scientific and technological, or whether there may be non-technical forms of reasoning applicable to social issues and day-to-day problems. Is it possible for the
average individual (not an expert in technical terms) to decide or control the technology, whose design he does not participate directly?

The goal of this paper is to contribute to the discussion about the Philosophy of Technology presenting two possible visions of Critical Theory applied to it. The background used is the ideas of Theodor Adorno, Max Horckheimer, and Andrew Feenberg1. The specific case of Information Systems coding through Social Networks is analyzed from the perspective of these authors.

**About the Nature of (Information) Technology**

Four approaches describe the nature of technology: (1) epistemological (epistemic status of technology); (2) anthropological (technology in relation to the nature of man); (3) sociological (technology as defining characteristic of thought and action in modern society); (4) metaphysical and existential (essentially Heidegger’s view).

In the epistemological approach, an example is Mario Bunge (1980), who neglects that technology is axiologically neutral and discusses an ethic of the natural and social responsibilities of technological innovation. He argues for the need for an integral, participatory and cooperative democracy, emphasizing that technological development must be at the service of all people. Still, based on typical assumption of the Illuminism that all tradition denotes backwardness, Bunge fails to consider that technology can shape the cultures in which it is introduced. Feenberg’s (2005) affirms that the eighteenth-century European Illuminists required that all traditions and institutions be justified as useful to mankind. Thus, science and technology became the basis for new beliefs and gradually changed culture to the rationalism. Moreover, technology is ubiquitous in everyday life, and technical modes of thinking prevail above others. It is possible to argue that techno-scientific rationality has become a kind of new culture.

The anthropological approach can be illustrated by Lewis Mumford (1970), for whom it is wrong to evaluate man as ‘homo faber’, thus configuring the importance of science and technology in contemporary society. He argues that animals also employ techniques and calls for the use of biotechnology tools, or, life-oriented technology. The true human differential lies in the development of language and culture. This technological orientation for life would have been lost when work and power took precedence over human life. This would have happened five thousand years ago, with the advent of mega-organizations of Egyptian slaves for the construction of pyramids and the Spartan and Persian armies.

In the sociological approach, Jacques Ellul (1964) claims technology as a central component and global attitude of being in the world. For Ellul, technology controls man, while man has the illusion of having control over it. The main problem identified by Ellul is that "technology presents a paradoxical way of operating: solving problems only through the creation of new problems and this has no end". Ellul does not believe in the possibility of a major change in this sense.

The metaphysical approach has Martin Heidegger as the main representative. He understands technology as linked to the question of being. The essential meaning of technology is not a mere process of making, but as a fundamental mode of revealing.

Dusek (2006) presents other possible characterizations of technology: (a) instrument; (b) rules; (c) system. Technology as instrument is seen as tools and machines. Mumford (1970) distinguished tool (user directly manipulates a tool) from machine (more independent of the skill of the user). Technology as a rule considers standards of behavior or technique compliant to rules of the essence of technology. These rules are embedded in software, or in the behavior induced by the way of using the machines (hardware) through a system of rules (software). The instrumentality outside the human context of use and understanding does not function as technology, for the technology seen as a system. So, a technological system includes not only the instrumental, as well as the human skills and organization needed to operate and maintain it.

An important aspect is that the tool-based approach tends to make technology seem neutral (a hammer can be good or bad depending on its use,); Rule-based technology shows that technology can be

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controlling (technology can induce man to certain actions). A technological system for Dusek (2006) is an instrumental complex, which may involve plants, animals, knowledge, traders, advertisers, government, etc., it can hardly be considered neutral, but instead, will possibly present its own values embedded.

Feenberg (2005) organized the lines of thinking about technology and summarizes those views presented in Table 1, where technology is classified through two axes that reflect its relation to values and the relation of power of man. The intersections show the theories that reflect these characterizations.

<table>
<thead>
<tr>
<th>Technology is ...</th>
<th>Autonomous</th>
<th>Human-controlled</th>
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<tr>
<td>Neutral</td>
<td>Determinism</td>
<td>Instrumentalism</td>
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<tr>
<td>(separation between means and ends; reference: Illuminism)</td>
<td>(example: Modern theory)</td>
<td>(belief in progress)</td>
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<td>Value-added</td>
<td>Substantivism</td>
<td>Critical Theory</td>
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<tr>
<td>(means forms a way of life that includes ends; reference: Greek thought)</td>
<td>(means and end connected in systems)</td>
<td>(choice of alternative means-end systems)</td>
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Table 1. Understanding Technology Classification (Feenberg 2005)

On the vertical axis, technology is neutral or technology is value-added. In the horizontal axis, the technology is considered autonomous or human controlled. Autonomous technology does not mean that it is self-produced; human beings are involved, but the question is whether they have, in fact, the freedom to decide how the technology will be developed. Instead, technology is human controlled; we can determine the next step of evolution according to our intentions. From these two axes, four quadrants stand out.

Instrumentalism (human control and neutrality) is the modern standard view, where technology is simply a tool or instrument of the man with which he addresses its needs. This perspective is linked to "belief in progress" as a dominant tendency in Western thought until very recently.

Determinism (autonomy and neutrality) is a perspective from the social sciences (mainly from Karl Marx 1990), according to which the technological advance moves the history. In this context, the man does not control technology, but it controls man, i.e., "technology shapes society to the requirements of efficiency and progress" (Feenberg 2005). Adapting technology to his desires does not depend on man, but on the contrary, man must adapt to technology as an expression of humanity.

Substantivism (autonomy and substantive value-added) attributes substantive values to technology, which means, technology is not neutral. A substantive value involves a commitment to a specific conception of a "good life." The author points out that the use of technology for a given purpose is in itself a specific value choice. Technology is not simply instrumental to whatever value a person has; it already carries certain values. Therefore, a society that chooses the path of technological development will necessarily be transformed into a technological society, dedicated to values such as efficiency and power.

Heidegger is one of the great substantivist theorists of the twentieth century, pointing the characteristic of modernity as the triumph of technology over all values. According to Heidegger, Greek philosophy founded his understanding of 'being' in the technical making, and it culminates in modern technology. Modern man turns everything into raw material for technical processes, including himself.

The Critical Theory of Technology, as proposed by Feenberg (2005) (human control and substantive value-added) recognizes the bad consequences of technological development highlighted by Substantivism, but still believes in a promise of freedom in technology. The problem is not technology, but in man's failure to develop appropriate institutions to assure human control over it. Critical Theory believes that it is possible to govern technology through a democratic process of design and development.

Critical Theory Interpretation: Adorno & Horkheimer’s Perspective

The Critical Theory of Society of the Frankfurt School is a theoretical approach that aims at analyzing the scientific character of the human sciences, that is, the unconditional belief in empirical databases as an explanation of the Social phenomena. It deals with the organization of workers and appreciation of culture as an element of transformation of society. Therefore, it is based on the fundamentals of the Marxism to explain the development of society and the formation of classes, and in the Psychanalysis to explain the formation of an individual that composes a social group.
The Critical Theory of Society offers a critical point of view about the conflict between science and culture, presenting a proposal for the society reorganization, in order to overcome what they called "crisis of reason" or "crisis of science". The understanding that reason is the element of conformity and maintenance of the status quo, suggesting then that a reflection on this rationality became essential.

The authors argue that the price that man pays for the increase of power is the distance from what he exercises his power. Adorno and Horkheimer (2002) state that on the path to a modern science, men renounce meaning and substitute the concept for the formula, the cause for the rule and probability; what is not submitted to the criterion of calculability and usefulness becomes suspicious to the Illuminism.

For Adorno & Horkheimer, progress is synonymous of technical progress; or, using a Karl Marx’s term, productive forces of human knowledge and skills to dominate natural and social processes. This progress would always be a service of profit maximization, so that this dimension of the technique is considered sacred, like an irreversible horizon. Adorno and Horkheimer (2002) tracked the emergence of the so-called mass culture with the development of new communication technologies, especially the radio. These authors strongly reprimanded the electronic media, claiming a resemblance to fascism and the mass media of the twentieth century. Adorno called television a "reverse psychoanalysis", for it holds the potential to make people unconscious and childlike.

The authors discuss the issue of cultural industry in the light of, as they call, the Dialectic of Enlightenment (Illuminism). For these authors, Illuminism is a project to dissolve the myths and replace the imagination by the knowledge (Adorno and Horkheimer 2002). However, in the view of the Critical Theory of Society proposed by these authors, successful progress is exactly the guilty of its own opposite, that is, the unstoppable regression.

Also according to the Frankfurt School’s analysis, there is a relationship between technology and ideological domination, since technology is often the product of scientific research or is associated with scientific development directed by an instrumentalized reason. The reason inevitably reflects the views and intentions of groups that hold economic and political power, and thus exert their influence. For the purposes of maintaining existing power, this reason (the dominant group model) determines science operation. It can occur in cycles until crises or revolutions are able to break this system.

Horkheimer (1982) affirms that the invasion of technology in the cultural sphere brings tragic consequences for individuals, since it steals from them the capacity to face critically and consciously the social reality. Instead of free time being destined for the cultivation of the mental faculties and for the promotion of the potentialities of individuals, which would even mean the possibility of maturing embryonic levels of resistance to the established order, it is filled by the entertainment industry, and destined to recovery and improvement of the forces for the work, in the period of time that the worker is not physically present in his workplace.

A discussion based on Adorno and Horkheimer’s ideas regarding the cultural and entertainment devices can be transposed to Information Technology in the present day, particularly with the advent of the Internet, and more recently the intensification of the participation of the people and sharing of information on social networks. According to Rüdiger (2011), the criticism of the cultural industry made by Horkheimer (1982) could benefit the analysis of the current phenomena related to the Internet, since it constitutes a platform of Cyberculture, and it is a new support to the process of conversion of the culture into merchandise, but now, on an even more massive and immediate scale. Some specific issues highlighted by these authors, such as the deregulation of productive activities and the repetition/reproduction of standards, are accentuated by the advance of information technologies. In this paper, two points are particularly highlighted, as follows.

At first glance, since there is an immense possibility to access all kind of information, collecting information seems imperative within this environment. In a second complementary perspective to the first, it is this a dual mechanism that allows the same kind of "standardization" and control pointed out by Adorno and Horkheimer in the Cultural Industry. Besides, the wide investment in the development of Artificial Intelligence and Computational Intelligence boosts increasingly this scenario.

The democratization of information access has never been as widely publicized and promoted as in the Internet age, and the most frequent propaganda is about the supposed individual freedom insofar as content can be tailored. However, as already alerted by Adorno’s discussion about the Cultural Industry,
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despite the undeniable utopian potential of computerization and connectivity (especially for mobilizing people, and building a space for group political action and for individual practices), it does not materialize, remaining only as an illusion. Autonomous participants constitute social networks, joining ideas and resources around shared values and interests. Diversity and the massive public allow each user to publish any type of information without commitment to the truth. On the face of it, there is a paradox of a great dynamism in information sharing and its relevance from everyone’s viewpoint.

"Cyberculture can be understood as an expression of a mass culture, whose brand is the demand for popularity linked to an audience achievement marketing standard. The promotion of individual choice as a value, detached from its objective context, only masks the fact that, what really happens is only the bet on familiar formulas and self-presentation styles capable of bringing us popularity" (Siegel 2008).

According to Rüdiger (2011), the conviction that information needs to circulate freely hides the fact that, it is not itself free; i.e., when the standard that regulates it is the individual irresponsibility, everyone tends to lose out from the perspective of a broader dynamic. Individual expression in Cyberculture almost always tends to be merely copied, or re-packaged by others according to some marketing plan. There is implicit manipulation and information through propaganda disguised in the dissemination of information. In addition, it is easy to observe the creation of "truths" by the masses, when propelling with propriety this same information, that mostly has a character of dissimulation and manipulation.

Social Networks mostly produce "images". Copies of information in diverse formats, manipulated by software applications that distort their original appearance (whether it is a text or an edited photo, a cropped video without credits, etc.). The point here is not the manipulation itself, but the fact that the information is "sold" as the original. The viral propagation of such images often causes the origin to be lost and the new image to be taken as "truth". The truth does not seem to be a tonic in the social networks. People tend to speak what makes them more popular and adopt postures and opinions guided by the recommendations provided by the information systems. Truths are masked and the logic of massification proceeds without being necessary to identify a performative.

Freedom of expression and access to information made possible by social networks bring the issue of massification, not only as a procedure of a performative act of the State, but of the collective. An example is the publication of facts or results of scientific experiments in non-specialized media that can be widely disseminated and taken as truth by the population without discussion or questioning. However, on the same day, another "scientific novelty" opposite to the previous one appears and is adopted without modesty by the same consumers keen to create movement in the networks. Thus, the concept of lie or false starts to make no sense anymore. One more concern stems from this. What is true or false in the web of dissemination of information manipulated by the collective? Does it still make sense to reflect on truth and lies? Returning to the reflection of Adorno and Horkheimer: "To put the human word as something absolute, as a false imperative, is the immanent tendency of the radio. The recommendation becomes a command". (Adorno and Horkheimer 2002).

An offensive of recommendations is impinged in Social Networks. At all times people spend "interacting" with each other and with systems over the Internet, they are simultaneously providing relevant information about their profile, useful to the interests of this “new cultural industry”. Targeted and supposedly customized information programs the minds of potential consumers, not only with products, but with ideas and ways of acting and thinking. Advertising is increasingly confused with information.

Science and technology use Statistics to affirm and determine standards. Behind each information made available, there are "safe bets," or probable truths. In this context, Computer Science relies on the advancement of the techniques associated with the term Artificial Intelligence to "propose the best solutions and alternatives" that should recommend, induce or guide the decision making of the citizens. As an example, the most popular social network offers suggestions of what were your best moments in the recent past, who are your best friends, and it is able to associate your profile with animals, games, music, groups, etc. (“Who would I be if it were a song?”). In addition to emphatically suggesting even the form of joining a protest or solidarity with some social everyday problem in a standard and stylized format according to the design previously made and offered to citizens.

Accordingly, as Adorno and Horkheimer have already stated: "The cultural industry ends up putting imitation as something absolute. [...] The common denominator culture already contains virtually the
statistical survey, the cataloging, the classification that introduces culture in the field of administration" (Adorno and Horkheimer 2002). The application of statistics and computational techniques of classification has reached a very high degree of sophistication in contemporaneity, promoting a sense of belonging (or non-belonging) to certain groups. Are your friends interested ('like', in the language of the Net) in an object? Will you be left out? The system knows what interests you. It has already “learned you”, your behavior, and tells you what you should consume.

The danger of cyberspace is to promote an abandonment of concerns with physical reality: "lost in the hybrid and strange world of the net, we may believe that virtual abodes are real, a reported clash is not distinguished from a real one, virtual sex is no less viable than the thing itself" (Slouka 1995). The nowadays cities inhabitant might only know friendship as social contact in Social Networks, social contact with people who do not touch intimately. Identity exists in the networks; who is not connected, does not exist. Increasingly: "Those who resist can only survive by integrating themselves" (Adorno and Horkheimer 2002). The function that sets up through this scenario seems to be related to promoting a philosophy where information technology is mixed with the way of life, and it apprehends the human being better than himself.

Critical Theory of Technology: Feenberg’s Perspective

The Critical Theory of Technology proposed by Feenberg (2011) combines insights from the philosophy of technology and constructivist studies of technology. Essentially, it is a framework for the analysis of technological systems at two levels: a primary level in which objects and people are decontextualized to identify dispositions, and a secondary level of re-contextualization in natural, technical and social environments. He assumes that technologies have distinct characteristics, exhibiting tendencies derived from their place in society, and he also defines the technical code as the rule according to which technologies are carried out in a social context with predispositions reflecting the unequal distribution of social power. However, for this author, subordinate groups can challenge the technical code with impacts on design as technologies evolve.

In deterministic and instrumentalist critiques of technology, efficiency serves as a single principle of selection between successful and unsuccessful technical initiatives. In these terms, technology seems to include the virtues generally attributed to scientific rationality. The philosophy of technology demystifies the claims for the necessity and universality of technical decisions. Constructivists show that many possible configurations of features can provide a working device capable of effectively fulfilling its function. The different interests of the various actors involved in the design of a technology are reflected in subtle differences in function and preferences for one or another conception of what is nominally the same device. Efficiency is thus not decisive in explaining the success or failure of alternative projects. Technology is not "rational" in the positivist sense of the term, but socially relativized. The result of technical choices supports the dominant social group way of life. Feenberg argues that the intervention of interests and ideologies does not necessarily reduce efficiency, but influences their achievement according to a broader social program.

Feenberg does not believe in the notion of technology neutrality. Neutrality generally refers to the indifference that a specific medium means in the light of all possible means so that it could serve. If we assume that technology, as it is now recognized, is indifferent to human ends in general, then we actually neutralize it and allocate it beyond any possible controversy.

Currently, technology is employed with limitations that are due not only to the state of our knowledge, but also to the structures of power that bias that knowledge and its applications. Existing contemporary technology favors specific ends and obstructs others, since values and interests of dominant classes are embedded in the design of procedures and machines, and this is a typically modern phenomenon. Despite this, the author does not consider technology an autonomous entity, but rather the manifestation of a political rationality. Following this line of thinking, in his thesis, he argues that technology can only be modified through cultural changes coming from democratic advances.

Feenberg’s thesis has antecedents in the Frankfurt School, which he criticizes the pessimism regarding the potential for the current political system transformation. While Adorno and Horkheimer remained somewhat hostile to technology, Benjamin and Marcuse observed democratic potentials in technological development. For example, in Benjamin’s discussion of "mechanical reproduction" of art, he
advocates the ability of the new technologies of film and photography to moving museum art into the daily lives of the masses (Benjamin 1968). Marcuse's essay (1941) on technology anticipates his one-dimensionality thesis, and draws attention to the democratic potential of modern technology. He argued that modern technology forms a quasi-dystopic system that can be modified through political action.

Feenberg argues that technological development is under-determined by technical and social criteria of progress. Moreover, the process of adapting social institutions to technological development is reciprocal, i.e. institutions adapt while technologies change in response to the conditions they find. Feenberg identifies a social code of technology that blends efficiency and purpose, something that somehow legislates our lives.

There is a generalized technical mediation in the service of privileged interests that reduces human possibilities everywhere, imposing discipline, vigilance, and standardization to all activities (work, education, medicine, law, sports, media, etc.). Due this same thesis, reciprocally, the mediation of certain social interests makes the technological achievements abstract and decontextualized, seeming to belong to no particular culture. However, for Feenberg, it is precisely the perception of these limitations and deformations (or suppressed potentialities) that can stimulate transformative political movements. Because technology is ambivalent and can be instrumental to different political projects, every technological order is a potential starting point for divergent developments, depending on the cultural environment that configures it.

The social change suggested by the author needs progress criteria: as people’s capacity to take political responsibility increases, society progresses, the universality of the human being is fostered, freedom of thought is allowed, individuality is respected, and creativity is encouraged. Feenberg (2013) then proposes a new notion of socialism as a goal of cultural transformation. The author suggests interpreting socialism no longer as a political issue, or a stage to be achieved through a revolution, or a historical episode, but rather as a transition to another type of civilization, in which certain human potentialities are denied today. He cites as concrete measures: the democratization of public administration, the increase of time devoted to learning beyond the immediate needs of the economy, and the transformation of techniques and professional training to include a growing range of human needs in the technical code. In this sense, the various technically underdetermined aspects of design must be decided with respect to social principles and demands. This context should be broadly understood to bring technology into the public sphere, where it seems to belong ever more.

In Feenberg's proposal (2013), modern societies will only be able to realize democratic values when public control of technology becomes routine. Like any other democratic movement, democracy produces democracy; public technicians, like any other (dis) empowered group, can learn through how to apprehend their interests and demand that public institutions meet them. Thus, the Critical Theory of Technology presented by the author projects a future in which technology policy is recognized as a normal aspect of public life. In this system, the technical work would have a different characteristic. The design of technologies should be consciously oriented to politically legitimized human values, contrasting to profit intentions of military or bureaucratic organizations. These values should concern technical disciplines, just as the value of healing guides the Medicine and the knowledge of the human body guides Biology.

Feenberg defines the Theory of Instrumentalization, which seeks on the one hand the distinction between the cognitive and imaginative conditions of technical activity and, on the other hand, the social mediations that intervene in the design of devices and systems. Every technical device presupposes the ability to be perceived by the world in terms of functions and capabilities. This perception is quoted by Feenberg as "Primary Instrumentalization". In this scenario, objects of technical activities are defined and isolated from their natural context through primary instrumentalization that decontextualizes them and reduces them to aspects of their use. Technical objects can only be realized in a device or system by acquiring social determinants at each stage of the production process, from the raw material to the final finished product. The sub-determined technical aspects of the object are decided along the way, in order to adapt it to a given social context. This process of social determination is called by Feenberg "Secondary Instrumentalization". So, at the second level, designs can be integrated with already existing devices and systems with social constraints, such as ethical and aesthetic principles. The primary level simplifies objects for incorporation into a device while the secondary level integrates simplified objects into a natural and social environment. It is a process similar to what Heidegger calls the "revelation" of a world.
This "revelation" involves a complementary process of realization, which qualifies the original functionalization, directing the device to a new world involving the same objects and subjects.

The author introduces the concept of technical code to articulate the relationship between social and technical requirements. A technical code is the realization of an interest or ideology in a technically coherent solution to a problem. A technical code is a criterion that selects between alternative (technically) viable projects, the techniques to be applied in terms of a social objective. Objectives are "codified," in the sense of defining items as ethically permissible or prohibited, and/or aesthetically better or worse, or more or less socially desirable. These types of codes reflect the secondary instrumentalizations, such as ethical and aesthetic mediations.

For the understanding of his thesis, it is still necessary to define and distinguish the concepts of substantive bias and formal bias. The 'substantive bias' is based on questionable beliefs based on facts that have no place in the technological sphere. This is what common sense understands as prejudice for unfair discrimination. They are obvious technology effects and easy to perceive by anyone. Yet, the 'formal bias' is introduced by the Critical Theory of Technology, and its goal is to explain how a rationally coherent, well-designed and operationalized device or system can still discriminate in a given social context. Formal bias confronts notions such as racism and serves the purpose of admitting criticism to rationalized activities that seem weak when abstracted from context, but which generate unfair consequences in that context. Feenberg argues that the identification of formal biases is central to democratic advancement in modern societies.

It is also in this sense to discuss the concept of modern society, since according to many scholars and thinkers we are supposed to be 'postmodern' or 'non-modern'. Nevertheless, Critical Theory of Technology argues that we must choose between alternative forms of modernity. This is because it distinguishes between societies based on modern technology and others. An 'alternative modernity', according to Feenberg, would recognize the power of mediation of ethics and aesthetics at the level of technical disciplines and design, bringing back power to members of technical networks rather than concentrating it at the top of administrative hierarchies. This would result in new technical designs and new ways of achieving efficiency, and its members would value the offer of quality of life, a more democratic political order and a sustainable civilization.

The technocratic tendency of modern societies represents a possible path of development. By subjecting human beings to technical control over traditional lifestyles and by limiting their participation in design, technocracy perpetuates elite power structures inherited from the past in technically rational forms. This process mutilates not only humans and nature, but technology as well. The greater implication of this approach must do with the ethical limits of the technical codes elaborated under the rule of operational autonomy. The same process, in which capitalists and technocrats were freed to make technical decisions without considering the needs of workers and communities, generated a wealth of new values and ethical demands. Essentially, the democratization of technology is related to finding new ways to privilege these excluded values and to realize them in new devices. Fuller realization of technology is possible and necessary. We are increasingly being warned of this need by the threatening side effects of technological growth. In our society, which is completely organized around technology, the threat to survival is clear.

Therefore, Feenberg argues that only the democratization of technology can help, and the dissemination of knowledge alone is not enough to achieve this goal. The range of interests of the actors involved should be exposed, to make it more difficult to transfer the negative feedback into groups without power. Only a democratically constituted alliance of actors, sufficiently exposed to the consequences of their own actions, would be able to withstand harmful designs.

Such a broadly democratic technical alliance would take into account the destructive effects of technology on the natural environment as well as on human beings. Democratic movements in the technical sphere aim to form such alliances. But this implies restoring the agency of people treated as management objects by the dominant technical code. It will not work simply multiply the number of managers. Subordinate actors must intervene in a different way from the dominant ones.

Feenberg discusses his proposal in the light of the example of interaction through computer networks and more specifically of environments oriented to distance education. At the beginning of 1980, the emergence of the new communicative practices of the online community was witnessed. Subsequently, we saw cultural critics inspired by the theory of modernity to recycle the old approach to this new application,
denouncing, for example, the supposed degradation of human communication on the Internet. Borgmann (1984), for example, argues that computer networks restrict human beings to "users" who can easily control a stream of data. The "post-humanist" approach to the computer and interaction (information exchange) in social networks suffers from related problems. This approach often focuses on most of the "inhuman" aspects of informatization, such as anonymous communication, online role playing, and cybersex. Paradoxically, these aspects of online experience can be interpreted in a positive way as the transcendence of the "self-centered" self of modernity. But such post-humanism is ultimately an accomplice of the humanistic critique of computerization that it intends to transcend in the sense that it accepts a similar definition of the boundaries of online interaction. Again, what is missing is some sense in the transformations that technology suffers at the hands of users who are more enthusiastic about more traditional views than might be suspected of this choice.

Towards a Practical Approach for the Stated Problem

Returning to the examples of actions proposed by Feenberg (e.g. democratization of the public administration, extension of the life time dedicated to learning and transformation of techniques and professional training to include an increasing range of human needs in the technical code), two projects characterize concrete actions. The implications of these projects might result in a society interested and prepared to deal with Secondary Instrumentalization and design of technological artifacts aware of its technical codification.

The project entitled "I, SOFTWARE: AUTO REPRESENTATION, COMMUNICATION OF IDEAS AND ATTITUDES CODIFIED IN SOFTWARE" aims to recognize how and to what extent, when constructing computer programs, people represent what they are, communicate what they think, express their values and attitudes. Prof. Clarisse S. de Souza explains that a special line of research is focused on programming by lay users, who grew up with computational literacy as part of the functional literacy of 21st century citizens. The proposal is to teach elementary school students the ability to express ideas and personal narratives through the programming of games and simulations. The goals of the project are (i) study self-representation signs, and explicit or implicit self-expression in computer programs, (ii) provide a consistent semiotic definition of signs as self-representation and self-expression in programs; (iii) identify their instances and conditions of instantiation; (iv) typify them from the perspective of who produces and who interpret them; and, (v) analyze their effects in some contexts of the use of computer programs.

The SCALABLE GAME DESIGN BRAZIL PROJECT is the Brazilian version of the work of Professor Alex Repenning of the University of Colorado at Boulder on Computational Thinking Acquisition. The goal is to carry out research on the following topics: computer literacy, programming languages for end users, meaning and communication with hybrid representational systems, and cultural dimensions in computing.

The understanding that computer programs embody a sense of who builds it, and even more, it is necessary to give people (who are not necessarily professionals in this area) the means to design these artifacts (secondary instrumentalization, as the notion developed by Feenberg), is clear. The world of technology life is the way the actors get involved with the computer. In this world, processes of interpretation are central. Technical resources are not simply previously given, but acquire meaning through these processes. With the development of computer networks, communication functions were often introduced by users, rather than addressed as normal requirements provided by the creators of the systems. To make sense of this story, competing visions of designers and users must be introduced as a significant force in modeling. The struggle between control and communication, humanism and post-humanism should be the focus of the study of innovation, such as the Internet.

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2 Both projects have been developed by Professor Clarisse S. de Souza in the Informatics Department at Pontifica Universidade Católica do Rio de Janeiro (available at: http://www2.serg.inf.puc-rio.br/index.php/research)

3 https://sgd.cs.colorado.edu/wiki/Scalable_Game_Design_wiki
Conclusions

The Critical Theory of Society proposed by Adorno and Horkheimer provides a reference for analyzing the notion, effects and impacts of technology, which allows distinguishing the massification and doctrinaire tendencies. In the specific scenario of information systems, more specifically the applications used in information socialization networks, we can emphasize the dissemination and wide reach of "false truths", the classification and grouping persuading the interests of individuals to goods and consumption, and besides, the monitoring and absence of privacy. Therefore, a supposedly free society, with individuals owners of their acts and speeches, seems to be in fact submitted to the interests of those who hold power over the system. However, dealing with these elements is no trivial task, and neither eliminate them.

On the other hand, the Critical Theory of Technology proposed by Feenberg points out the need for concrete actions. The appropriation of technology no longer concerns only learning to use software or being comfortable with a number of interface mechanisms between the human being and a black box that fits into the core of the technology in question. Political and educational actions are required.

Technology is a matter of public administration. Therefore, there must be a commitment to democratization as well (as in other spheres) of access to decisions about development, investment and use of technologies. The role of education to promote a broadening attention to technology-focused learning would include the frontiers of technology ethics and aesthetics and technological development. Computational thinking and design, as well as languages and mathematics, seem to be disciplines of our time. A project aimed at a Technological Education, combined with a real project of Democratization of Information, are now urgent, or according to Feenberg, the option for an alternative modernity.

REFERENCES