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Cyberspace as a system and a social environment: a theoretical proposal based on Niklas Luhmann

Abstract

As has been the case with most of the advances in communication technologies throughout history, social theory has chosen an anthropocentric approach to the analysis of cyberspace. The human being is placed at the centre of the theoretical model, and as a logical consequence, findings have been oriented towards describing the positive or negative effects of the phenomenon on society and the individual. Without discarding the validity or necessity of these perspectives, whose genesis and evolution we address synthetically and diachronically, we propose to improve on them in order to better understand the functioning of cyberspace. To do this, we will apply to the study of cyberspace the systemic approach of Niklas Luhmann, who proposes going beyond anthropocentrism, which he considered to be an "epistemological obstacle", to use Gaston Bachelard's definition. For Luhmann the characteristic element of social systems was not individuals, but communications. By applying this new paradigm, we will consider whether cyberspace complies with the central features of social systems or if whether it functions like a social environment. In the conclusions, we will observe that cyberspace is in part a system and in part an environment; in other words, what we would call a social hypersystem. It is a communication system that is autonomous and self-produced technologically, but it is, at the same time, the environment of the social system, representing in itself the possibility of increasing its complexity.

Keywords

Luhmann, cyberspace, social system, communication theory, technology, Bachelard.

1. Introduction

We understand cyberspace as the set of possible communications that occur in the digital realm through different devices, channels and

media, and that allow interactivity between users. Ever since the appearance of the concept in the 80's[1], there have been many attempts to define and study cyberspace, from various methodological approaches.

In this article we intend to address, as a matter of research, if cyberspace is a communication system capable of generating meaning autonomously or, on the contrary, a communicational environment of other social systems. To do this we will use the systemic approach of Niklas Luhmann. This approach offers us the ability to overcome the epistemological obstacles which - according to Luhmann himself - have beset the sociological analysis of technology since its origins, and which lead us to consider communication technology in terms of positive/negative (good or bad for mankind), or individual/society (heterogenising or homogenising).

Before fully addressing the systemic analysis of cyberspace, we will summarise the theoretical tendencies that analyse the emergence of cyberspace, in accordance with the epistemological angle from which each one observes the phenomenon. To do this, and to give some order to the profusion of approaches, we propose two descriptive variables. The first would see cyberspace as a source of *homogenisation*, union and a globalising matrix of the culture of mankind, which could be called "towards what is the same". The other vision, in contrast, would see the phenomenon as a platform of *social diversification*, of progressive social individualisation, personal autonomy and cultural atomisation; "towards what is diverse". Having said that, both processes (convergence and dissemination) can be seen as something positive or as something negative, or with positive and negative effects at the same time. To overcome these epistemological obstacles, we will turn to the evolved systemic approach from Niklas Luhmann. As we shall see, this Luhmannian systemic approach has its origin in general systems theory (Bertalanffy, 1984), and cybernetics (Wiener, 1948). The development of these theories leads us to "second-order cybernetics" (Maruyama 1968) and its translation to the field of epistemology (Von Foerster, 1991). At the end of this theoretical journey, as mentioned before, we arrive at Niklas Luhmann. For him, communication is specifically social; there is no communication without society, or society without communication. Luhmann uses the systemic approach to study society as an autopoietic (self-produced) system; self-observing and operatively closed. In this system, communication, the social element par excellence, has the function of social production of meaning. The question here is whether cyberspace meets the criteria that define a system (self-produced, autopoietic, operatively closed etc.) or whether it works as a communicational and technological environment of other social systems. This is the theoretical core of our research.

In terms of methodology, we will use the systemic-constructivist approach, firstly because this theoretical view, as a whole, provides an epistemological separation from - and improvement on - realism. In other words, the existence of an objective external reality is not denied, but it is acknowledged that it is impossible for the observer to know it, given his or her position within this reality. The human being is in the environment of the social system; as an observer of social phenomena this person is inside the object of observation, and, therefore, will always have a "biased" position. Consequently, the idea is not to assume a "sceptical" or merely "empiricist" or "physiologist" stance, but rather to establish the autonomy of communication systems. Secondly, the systemic-constructivist approach allows us to examine the parameters within which communication theories have worked throughout history, and to see how they have placed the subject in the centre of the system,

[1] In its inception, the notion of "Cyberspace" came from the science fiction novel "Neuromancer", by William Gibson (1984), who defined it as "a consensual hallucination experienced daily by billions of legitimate operators, in every nation".

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instead of communication. Following systems theory, in this way we can undertake a second-order observation (i.e. the observation of the observations). In this way, we will see how communication theories work, until reaching cyberspace, and how, by analysing this and applying the systemic-constructivist perspective, it is easier to understand the autonomy of communication.

We are aware of the difficulties involved in ruling out the individual as the nodal criterion of the sociological analysis of cyberspace, but we are even more aware of the difficulties posed by including it. In the "human" scale, everything - and cyberspace is no exception- has been measured in terms of what is good/bad, appropriate/not appropriate, of its effects. In other words, it has been an ethical, anthropocentric debate. This central concept has distanced us from a critical reflection on how communication works, as an autonomous process (autopoietic) and its ability to create meaning. At this point, we share Luhmann's belief that communication is what is exclusively social, and not action (which may occur outside of society).

We will now take a diachronic and descriptive journey through theories of communication, to reach those that address the emergence of cyberspace as a new communicative space. We will then look at the application of Luhmann's systemic approach.

2. Theoretical background and classification of the theories

There are different categorisations of the discussion on technology, to reach a systemic proposal. The most interesting alternative can be found in Feenberg (1991), who includes the division between instrumental theory, which treats technology as subject to the principles set out in other fields such as culture or politics, and substantive theory, which gives technology an "autonomous cultural force". Constructivism's idea of analysing systems without subjects is, therefore, a methodological procedure, and it does not exclude or weaken the subsequent, true and irreplaceable social and ethical dimension of the debate: which technology to make and what to do with it. This objective exceeds the limits of this research, but we must not ever be indifferent to it. It permeates the diachronic journey that we are taking, and can be traced back to Aristotle, gaining ground in the 19th century with authors such as Kapp, Engelmeier or Dessauer.

Cyberspace has been seen, thanks in part to the theories of Teilhard de Chardin (1965, 1968) and his Noosphere concept; as that convergence of individual consciences, diluted, mixed and synthesised in a shared supra-consciousness, beyond the contingent individualities. McLuhan (1962) would take up De Chardin's theories at an essential point: communication technologies tend towards the consensual unification of the world, now updated in a *Global Village*. The implosion of technology not only represents an extension of our body, but of our "consciousness", acting as a true collective brain ("universal consciousness"). After McLuhan, and closer in time to cyberspace, some theorists analysed this idea of a spiral of knowledge that, in an accelerating process, contributes to the progress of humanity (Toffler, 1980). This would not be a redirection of history toward a socially shared common knowledge, but quite the opposite, toward the disintegration of the elements that compose it, on amplifying the disintegrated self from the rest of the members of society. These theories can be related to the theories of "molecular identity" (Deleuze, 1988; 2005) and those of Derrida's deconstruction, weak thought or the theories of hedonistic individualism in the "Age of Emptiness" (Lipovetsky, 1986; Harvey, 2004).

Against this optimistic background, there is also some more critical or pessimistic thinking about the evolution of technology, which goes from Rousseau to "Luddism", as the most evident reaction to these misgivings. Philosophers from the Frankfurt School, such as Benjamin, Horkheimer, Adorno and Marcuse "suspected" the communication technology of

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mass society, in the same way that Marx was suspicious of the capitalist relations of production, and Freud of conscious language.

Following 1984 Orwell's novel (1949) and the analysis of Adorno et al (1965) at the theoretical level, Michel Foucault would consider the political implications of the Panopticon from the disciplinary point of view (Foucault, 1989). We will now move on to the post-modern or post-structuralist theories, which, without wishing to systematise a negative critique in the face of post-industrial society, begin to analyse the phenomenon of the consumption of symbols (Baudrillard, 1996; Debord, 2009).

2.1 Cyberspace as a social binding element: "Towards what is common"

We start our theoretical discussion, following the classification that we have proposed based on the social effects of cyberspace, with those theories that attribute socialising or unifying effects to the new environment. These theories share the common denominator of viewing cyberspace as a platform for the generation of shared space.

The 1980s saw an increased demand from various quarters for an active construction of cyberspace as a free space outside of state controls. This is extreme thinking that has post-humanist techno-liberation as its objective. Its philosophical and conceptual roots are found in the post-structuralist thought of post-modern French theory, paying particular attention to Foucault (1990) and his conception of the body as a place where powers are exercised and, therefore, as a place of resistance; Derrida (1975) and his notions of deconstruction and dissemination as an infinite possibility of continuous re-readings, in this case of the self; and Deleuze, with his concepts of the rhizome, the "desiring multitude", "nomadism" and "molecular identity" as a mobile formula of the construction of the self (Deleuze, 1988; Deleuze & Guattari, 1991; Guattari, 1992).

It is here where post-structuralist theory converges with constructivism, providing a view of the autopoietic, self-generated identity, even though post-structuralists implicitly reject the notion of "system" which constructivists would stress. From a post-structuralist perspective, cyberspace would be a place of breaking down structures, a rhizomatic confluence of texts and speeches that "produce" the subject. From a constructivist perspective, though, cyberspace would be "systemic whole" autopoietic, self-observing and self-referential. It would tend to seek a state of dynamic balance within its own complexity and would be able to self-generate.

Thanks to the technology, and, especially, the research by the Massachusetts Institute of Technology (MIT), there is an abundance of theorists, such as De Kerckhove, Negroponte, Masuda and Kelly, who describe cyberspace as a global utopia in itself, with a technocentric thought that some call "technological utopianism" (Díaz-Nosty, 1995).

The most interesting conclusion underlying this perspective (De Kerckhove, 1999), cutting across the thinking of McLuhan and De Chardin, is that thought and knowledge now happen in the communication process (and, therefore, outside the individual). This would be in line with constructivist theories.

Castells, for his part, addresses the issue of the impact of cyberspace on politics extensively (Castells, 2003, 2009), and leans toward the concept of cyberspace as a new social reality. In a way, Castells sees, in cyberspace, the utopian possibility of the attainment of the plural, free society praised by the May 1968 thinkers, like Marcuse (1985) and his theory of the "multidimensional man", or reinterpreting Habermas and his Theory of Communicative Action. Other interesting contributions come from Dertouzos (1998), who linked the emergence of cyberspace with the increasing virtualisation of reality, and Ohmae (2005) on an economic level.

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2.2 Anomic dystopias

The theories that see in cyberspace the threat of atomisation have, in general, a background in the dystopian science fiction of the first half of the 20th century, which, depending on the communicational theories with origins in conductivism or behaviourism, question the ability of humans to emancipate themselves from structures of power and directional point-to-mass communication. The stable world of firm categories like nation, race or sex ceases to be a source of identity configuration, and gets lost in the incorporeal order of reticular and immaterial space in which the identity is a simulation (Piscitelli, 1995; Mons, 1994; Augé, 1992).

The ethical perspectives that consider cyberspace as a space of symbolic alienation, describing the effects of dematerialisation or derealisation, in other words, of distancing reality through the aggregation of symbols as the only possible reality, are based on the critical studies of the Frankfurt School. This school already saw alienating effects in the reproducibility and the Taylorisation of art. Adorno and Horkheimer (1998) would study the phenomenon, alluding to the suppression of nature to which the progressive instrumentalisation of reason inevitably leads. According to the Van Dijk's formal model (1991, 1997), a cyberspatial dystopia inspired by the fictional Big Brother and Bentham's Panopticon uses the infocratic framework, which responds to a remotely controlled and observed society, where there is no political or cultural diversity.

Cultural critics and identity theorists face the difficult challenge of redefining cyberspace as a device of the decentred subject (Foucault. 1979). In this approach, cyberspace represents the end of the subject: as Foucault had predicted, the concept of "what is human" is modified, as a core notion of identity.

2.3 The systemic-constructivist paradigm

We will now study how cyberspace is communication as a social action in itself, self-produced and reproduced. Meaning is produced in society, and therefore, through communication. This means that meaning does not precede society: there is no meaning outside society, or before it, or at its communicative self-production. From our point of view, identity and meaning are equivalent concepts. Social meaning is the social identity of a certain group, generated in society through communication.

The fundamental reasons why we address constructivist theory are the same reasons why this paradigm has already been applied to the study of social communication: its ability to explain complex phenomena; the self-observation of systems as a fundamental element; the centrality of the communicational component, and the importance that the creation of meaning has within the social system.

The systemic or constructivist perspective has been useful, above all, when addressing complex phenomena, discarding the traditional linear and analytical approaches that aspired to a full understanding of the object of study by breaking it into smaller parts. These parts would be studied without paying attention to the multi-vector relations that existed between them, and that provided the key features of complexity or uncertainty. A structural feature of the constructivist model is the impossibility of observing social phenomena outside of these phenomena: a person analysing a social phenomenon is involved in it, forming part, in this case, of cyberspace and immersed in its dynamics.

In this systemic-constructivist paradigm, Niklas Luhmann is an important figure, but we will follow the proposal of Rodríguez and Arnold (2007) to arrive at the German author, in a theoretical evolutionary process that includes various theoretical contributions.

In parallel, and within the constructivist field, Weiner (1948, 1958) was the first to come up with the concept of "cybernetics", adapted from the Greek κυβερνητική (cybernētiké), which refers to the notion of the helm of a ship, and, therefore, of control. And it is there, in

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the relationship between the system and the environment, through the flow of information, where a system finds its balance and counteracts its entropic tendency. However, Weiner's cybernetics, focussed on homeostasis[2], still leaves out an important aspect: morphogenesis, or the processes by which the system changes and deviates from its initial objectives, these being caused by positive feedback, an amplifier of the deviation. This would be studied by Maruyama (1968) and would give rise to "second-order cybernetics" and its translation to epistemology (von Foerster, 1991).

Maturana (1985, 1991) questions the conceptual basis supporting practically all scientific theory: the existence of an objective reality that is independent of the observer, which this observer can understand using rational methods. The change in approach materializes in the central concept of "autopoiesis", which we define as the condition of the existence of living beings (and of any system) in the continuous production of themselves. Organisational closure; the closure of systems, is a condition for their autopoiesis (Rodríguez & Arnold, 2007). Autopoietic systems serve to explain the behaviour of living systems, or systems of knowledge and communication, because these produce their own elements. All this theoretical development is summarised in the following table:

	Theory	**Relationship with the environment**	**Operation**	**System functionality**
Bertalanffy	G. Systems T.	Totally Open	Negentropy/equilibrium inputs/outputs	Homeostasis
Wiener	Cybernetics	Open to information	Feedback (negative entropy).	Morphostasis
Maruyama	Second-order cybernetics	Open to information Closed to energy.	Positive entropy	Morphogenesis
Ashby	Second-order cybernetics	Open to information Closed to energy.	Selection	Reduction of complexity, viability
Von Foerster	Constructivism	Closed to information	Observation	Self-observation
Maturana	Radical constructivism	Closed. Only open to energy	Experience/ Distinction	Autopoiesis

Source: Prepared by the authors

3. Application of Niklas Luhmann to the study of cyberspace

The above describes what came before Luhmannian theory, which is based on general systems theory, constructivist and cybernetic theories, and the contributions of Humberto Maturana, applying them to the field of communication. This application will be the foundation for our study of cyberspace, using the same theoretical instruments that Luhmann employed for his analysis of the mass communication media. "The Society of Society" (2007) and "The Reality of the Mass Media" (2000) are two excellent samples of Luhmann's thinking. The core of this involves ontologically linking the social phenomenon to the communicational one, establishing a systemic dependence between society and communication.

Luhmann's studies of communicational processes do not focus, as most cyberspace researchers have, on the technology or the technical characteristics of the environment, but

[2] The regulation of the deviation via negative feedback

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on the autopoietic operation of social media, through which the system generates meaning. The principles that guide his social theory are based on a critique that reverses, in the terminology of Gaston Bachelard, the "epistemological obstacles" (*obstacles epistemologiques*), in other words the traditional notions of sociology. Luhmann summarises these in four points:

1) That society is composed of concrete individuals and the relationships between them.
2) That society is established by consensus.
3) That societies are regional units with a defined political-territorial basis, based on the nation.
4) That societies can be observed from outside.

For Luhmann, first of all, society is not composed of human beings, but of communications, with individuals forming part of the environment of the social system. At this point it is useful to rule out any ethical or philosophical consideration, and insist on the methodological character of Luhmann's proposal, as he himself confirms when he points out the following:

> Whoever seriously considers the human being as a concrete and empirical unit, formed physically, chemically, organically and psychologically, cannot conceive of the individual as part of the social system. To begin with, there are many individuals, each one different; then, what is meant when we speak of a human being? Traditional sociology, which, as a theory of action, refers to the "individual", should be reproached. It itself does not take the human being seriously when speaking of it through nebulous constructions and without empirical references. It also does not take into sufficient account the fact that men live and act at the same time, although there are time horizons that refer to the past and the future. Therefore, the social order must be guaranteed in simultaneity, and not only as a projected sequence. The problem of "What is happening with man?" naturally only occurs in a theory which distinguishes between system and environment. If we reject this distinction, which is possible and permissible, very different approaches to problems are generated; very different constructions of the world. Systems theory is universal because it describes the world with the help of the differentiation between system and environment, but it does not maintain that this distinction is the only possible basis for a description of the world. It does not claim exclusivity. It does not claim to be the only correct sociological theory." (Luhmann, 1998: 15).

Or, as Borz and Obermeier point out:

> It is confirmed: when the individuals in society look around, they see other individuals. Science, in contrast, observes systems. Therefore, there is nothing easier than fooling individuals, and nothing more persistent to confuse science than the humanistic requirement of placing man at the centre. Luhmann's methodological antihumanism is a reaction against this (2006: 31).

The issue also deserves the reflection of Ignacio Izuzquiza (1990) and also gives rise to critical analysis, like the work of Rodrigo Jokisch (1999) in "The concept of man as an indispensable concept for the theory of society. Sociological notes from the point of view of the theory of distinctions", which deals with it extensively.

Secondly, society is not established through consensus, but though the differentiations and distinctions produced by communication. In the construction of this self-referential reality generated by communication, the action of the media favours information as a central value, and, therefore, gives preference to breakdown over consensus, and to conflict over normality. This overturns the aspiration, from the Enlightenment up to Habermas, to consider "consensus" as an objective value that can be realised though a rational use of

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communication: if there is truth, and a rational method is applied to the search for it, the only possible solution must be accepted by all.

But it is communication itself that dissolves the Enlightenment aspiration of consensus. It is the immanent dynamics of the mass communication media that produces and demands this constant breakdown, that persistent problematisation of reality, converted into newsworthy informative material. This problematisation, in turn, gives the media a paradoxical moral function, since these, while creating dissent, build a moral framework that rejects dissent, problems, confrontation: "Morality clearly needs, to rejuvenate itself, scandal; it needs the mass media and, especially, television" (Luhmann, 2000: 116).

Thirdly, society is global, with subsystems produced in its interior by society itself. Society would be a global system, closed by means of a "operational closure", composed of self-generated subsystems at its core, and that performs operations of distinction between system and environment. These social subsystems are linked together by communication, but it is interesting to note the universalist (global) vocation of society (as global society) in Luhmann's theory, which reminds us of the propositions of Teilhard de Chardin, and which is of great interest when addressing cyberspace.

Fourth, any observation of society is always done within it (Luhmann, 1998). In this sense, society has the ability to observe its own operations (it is a self-observing, self-referential system). These observation operations distinguish between self-references - observations the system makes of itself - and hetero-references- when the system observes what is outside (Luhmann, 2007). The logic of meaning, for Luhmann, resembles Deleuze (1996): as an unlimited process of construction, as a continuous differentiation between what is inside and what is outside, that is always unfinished and dynamic (the adaptation as a constant, and not as a variable coordinate).

Since communication is a self-produced, autopoietic process, within the social system, and made possible by this, communication cannot be affected by anything that is outside of it, because nothing outside of the communication, nothing that is not communicated or communicable, can exist by itself. Meaning does not exist before communication, but before language, which updates the meaning given in the consciousness (mental system), and is produced socially through communication (social system). Language is, therefore, the means by which communication links with consciousness, communication being the social phenomenon, and consciousness the individual and psychological phenomenon (Luhmann, 2005).

As Farias and Ossandón (2006) point out, for Luhmann, communication is formed as a level of emerging reality that results from a process of triple selection: selection of information, selection of expression and selection of an understanding. Communication, and with it, all that is social, is but the constant self-referential processing of these three selections, as well as the self-production ability of new communications. The unity of what is social lies, according to Luhmann, in the autopoiesis of communication; autopoiesis that can be understood simultaneously as structure and action. Luhmann insists that the system acquires meaning by setting limits, by drawing distinctions with the surrounding world (environment), to which it is structurally coupled in a process of constant adaptation, which makes the system a self-reference that opens out in time. The system acquires meaning (identity) through a constant, autopoietic process of understanding (self-observation and selection) and significant transformation of the complexity of the surrounding world, in its interior.

The distinction between system and environment is, therefore, the central issue of Luhmann's systems theory, which leads Luhmann (1997) to use "transversal autological concepts", since the observer has to be identified within a system that is inside the environment. If the system is in contrast to its environment, the internal difference within the system is the duplication of that system/environment distinction inside the system,

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which gives rise to subsystems. In this sense, a complex system is not composed of different parts that make up a whole, but of different "differentiations" that, operationally, are selected and used to redefine, in a more effective way, that relationship of the unit (identity) with the outside (Luhmann, 1982). From the above, it follows that the fundamental function of this system, in its environment, is its own structural endurance (morphostasis) by adapting to its surrounding world (morphogenesis). Social systems, which are the ones that Luhmann studies, use communication - which constitutes what is social - to constantly redefine the system/environment relationship; in other words, to maintain the unity-identity of the system, and identify the environment, as well as to introduce the changes that the system needs in its structural connection with the goal of maintaining its identity. In this way, systems can speak of themselves (self-reference), or communicate about the environment (hetero-reference), as we will now see (Luhmann, 2005).

For Luhmann, meaning is not defined through the subject, because this is a system that uses meaning, it is a significantly constituted identity. This is why the concept of subject implies the concept of meaning (Rodríguez and Arnold, 2007) In addition, the mass media are creators of social meaning as soon as, through the repetition of the selection processes of the information referred to themes, they impose a background, a conceptual framework that is implicitly accepted by all social actors (Luhmann, 2000). At this point, Luhmann distances himself from the rationalist theories of Jürgen Habermas -and Habermas from those of Luhmann, as described by Leydesdorff (2001)-, who observes communication as an instrument of reason to arrive at a consensual truth, consistent with its approach of extending rationality to the "world of life" previously excluded from it.

The complexity of today's society, that the mass media, through autopoietic processes, turn into dissent that generates new information, is even more apparent and clear in cyberspace, as we shall see, where distinctions produce new distinctions (variety creates variety), and where novelty is not selected in the social environment, but directly generated within the system itself. Complexity generates new complexity.

3.1 Theoretical principles and their application to cyberspace

Before applying Niklas Luhmann's communicational sociological theory to the study of the process of construction of meaning in cyberspace, we will define a Luhmannian map of principles that will serve to select those aspects of his thinking that will underpin the development of our hypothesis:

1. Society is an autopoietic, complex, global and all-encompassing system, both self-contained and self-observing (there is nothing outside of society), composed of communications, and not of individuals.
2. Communication builds the identity of the system (the meaning), on the basis of the system/environment distinction, through a reduction in the complexity of this environment.
3. These operations of distinction are divided into auto-reference and hetero-reference, depending on whether they refer to the system itself or to its environment.
4. Communication produces itself autonomously, and lays the foundation for its own development, although it is structurally attached to its environment and to the consciousness system.
5. Society is not teleological: it does not have a beginning, an end, or a destination.
6. The mass communication media create meaning through a process of selection of the system's irritations, which in turn produces more systemic irritation.

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7. Mass media constitute a social subsystem that is structurally attached to its environment through the "themes". Its success is based on its ability to impose the themes.

Projecting the Luhmannian model on the study of cyberspace requires examining these principles one by one, looking for the differences between the mass communication media system and the cyberspace one, and trying to find the structural equivalences that allow such application.

3.2. Cyberspace as a system

Following the framework above, we will respond to each of the seven hypotheses in turn, to arrive at our conclusions:

The first point we consider is: Is cyberspace a social system?

According to Luhmann, the inherent characteristics of a social system can be summarised as follows: It is autopoietic, i.e. self-produced on the basis of its own elements and its own operations (it is dynamic); it is differentiated from its environment; it is operatively closed; it is a closed system; it is structurally attached to its environment; it is composed of communications, as the minimal unit of the system; it performs the operation of reducing the complexity of the environment through a process of selection, and, finally, it is self-observing.

Reviewing the characteristics one by one, we find that if cyberspace was a social system it would be autopoietic. That is to say, it would have built itself from its own elements and its own operations, which are none other than the binary language of computers, and the networks from which all software develops.

It would suffice to recall how, firstly, universities, and then hackers with an interest in creating their own exchange system, weave the network, which produces itself in an autopoietic process. How does cyberspace produce, then, its own elements? How does it generate that constant self-reference? The internet user is an observer whose operation is two-fold: to select distinctions within cyberspace (i.e. navigate routes that he/she decides when reading), and to create irritations that, in turn, will be selected by other internet users, who will also generate irritations and extend the network of the system, which can, in turn, be selected, and so on.

Is cyberspace differentiated from its environment? The question presupposes that cyberspace is a system with a definable environment and, therefore, to avoid this tautology, we could rephrase the question: If cyberspace was a system, would it not have an environment from which it would be differentiated? If this were the case, what would this environment be? And what would be the identity, the meaning, of the system, that would differentiate it from that environment?

We can answer this question if we look at the distinction that Luhmann makes, in his communicational model, between “making known”, “information" and "understanding", as constituent elements of any process of communication.

Cyberspace is a constant making-known (or “expression"). “Making known” in itself does not serve as a constituent value of a system, because its environment cannot be what is “not made known”. Besides, cyberspace does not imply a process of reducing the surrounding complexity converted into "information", in the media sense of the term, as “novelty". It is, in this sense, a system that is as complex as its environment, capable of accommodating all the possible communications of all the social subsystems, like a Borgian library. We do not see that the system is operationally closed as regards the notion of "understanding" either. This is because its survival does not depend on the information made known being understood by the receiver, and, in addition, the very notion of receiver is not valid in the constructivist approach to cyberspace.

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However, as we have seen, cyberspace presents the double opportunity of collecting the potential entirety of the social system's communications, and of producing new communications. Cyberspace is, therefore, in part a system and in part an environment; what we could call a "social hypersystem". While it is an autonomous and technologically self-produced communication system, it is, at the same time, the environment of the social system, constituting in itself the possibility of increasing the complexity of this environment. Cyberspace self-selects the irritations created in it, and generates new ones, producing a complexity that self-generates constantly; a second-order complexity, or "hyper-complexity."

In relation to the question of whether cyberspace is operatively closed, we can observe that it is, since its own structures can be built and transformed only through its own operations. The operational closure of cyberspace as a social hypersystem, fulfilling the dual role of system-of-systems and environment of the social system, is done to itself, since cyberspace itself generates its own unlimited complexity.

These subsystems self-generate within cyberspace through autopoiesis; the existence of others, their multiplicity, forms the internal environment of each of them.

With regard to the issue of structural coupling to its environment, the reduction of complexity and being self-observing, it can be concluded that cyberspace is not structurally attached to its social environment, because it functions as the environment of the social system. It is the social system which is structurally attached to the environment that constitutes the hypersystem of cyberspace. In other words, cyberspace does not select irritations of the social system through themes, because cyberspace is not less complex than the social system, but as, or more, complex. It is, in any case, the social system, through the subsystem of the mass communication media, which selects the irritations of cyberspace through themes. These irritations, transformed into information, as well as those themes, are returned to cyberspace, which can self-observe in this way. What is more, cyberspace is the self-observation of the social system, because it contains the potentiality of all social communications.

In the second principle of the model selected to apply Luhmann's theory to the study of cyberspace, we pointed out that communication builds the meaning of the system (its identity), on the basis of the system/environment distinction, through a reduction in the complexity of that environment.

Here we must ask ourselves: what is the meaning of cyberspace? We pointed out that cyberspace distinguishes between what is made known and what is not made known. However, any communication made in the media system is liable to be admitted into the hypersystem. Cyberspace only remains impenetrable to what is not communicated, which, from a systemic perspective, is an element that is not social.

As a social hypersystem its internal complexity is always increasing, and the operation by which the potential is updated only requires "time". Luhmann reflects on the paradox that dissociates "size" from "complexity", questioning whether a system like the brain may not be more complex than society (Luhmann, 2007). The structure of cyberspace is a huge network where from one node, you can reach all the others. Everything is potentially connected to everything, and the selection of the links, the management of this complexity, does not correspond to the system, but to the observer, who forms part of the system. In no other system but in cyberspace does observation as a process mean selection: active observation, constituent of a route that connects nodes in the form of "navigation".

Points three and four questioned self-reference and hetero-reference, and the self-production of the system through communication.

We have already seen, at the beginning of this section, that cyberspace self-generates through a process of autopoiesis. As regards the distinction between self-reference/hetero-reference, in the social hypersystem of cyberspace, based on the structural attachment

between social systems and communication systems, this distinction would be meaningless. There can be no hetero-reference because nothing that is outside of the system can be named by the system or be inside it: at the moment that it is made known, it already forms part of the limits of the system, because the system is the potentiality of itself, the possibility of its own limits, whether they are updated or not. The hypersystem of cyberspace is, therefore, a self-referential system.

In the fifth point we read: "Society is not teleological: it does not have a beginning, an end, or a destination". This proposition derives from overcoming an epistemological obstacle that Luhmann aimed to resolve at the start of his reflection. It is the one that states that society is a system of people that perform actions. Luhmann considers that people by themselves, or isolated actions, are not sufficient to constitute a social system. Only communication is a purely social action.

It is easy to understand how, if the system is composed of communications that produce communication, this ceases to be a *telos*, it ceases to be transcendental. The evolution of society is not linear, since the linear model is unable to represent complexity, and becomes circular, closed, systemic, as occurs in cybernetic theories and Theories of Systems.

Methodologically, we are interested in understanding the absence of transcendental illusion, in Kantian terminology, of Luhmann's communicational conception. And this is derived from the very same circular structure of communication: it only refers to itself, as an autological and self-referential procedural description, and, therefore, cannot describe the object; it only describes its description of the object.

Cyberspace lacks a objectival environment because it is all-encompassing; it *is* the environment. It does not produce a consensual illusion, nor is it the dialogical space for a dialectically found universal reason. It is the opportunity to create communication subsystems that are internal, closed, autopoietic, self-generated and defined by the exteriority of the difference, by the internal environment that the other subsystems constitute.

Points seven of the theoretical model referred to the role of "the mass communication media as creators of meaning through a process of selection of the irritations of the system", and their ability to "impose themes" in the system.

On these points, we have seen that cyberspace "does not select" the irritations of the system, but it selects its own, that has been previously generated. In the dual relationship of cyberspace with social systems, both as a system and a systems environment, cyberspace is not fulfilling the role of mere selector of elements and, therefore, of reducer of external reality. Contrary to what happens with the mass communication media, which highlight what they believe to be relevant from the environment, giving it meaning in this way, cyberspace does not "select", but "absorbs" the irritations and signs, from which it creates new signs, new complexity. To put it another way, cyberspace is not the "selector" of the irritations, but rather the producer of them. The social systems are the ones that "extract" and select the themes that are dealt with in cyberspace.

4. Conclusions

At the beginning of this article we questioned if cyberspace functioned as a communication system capable of generating meaning autonomously, or, on the contrary, a communicational environment of other social systems.

To address the issue, we proposed to use the systemic approach of Niklas Luhmann, because of its ability to overcome the epistemological obstacles that have beset social studies of technology since their origins, and which invariably lead us to consider

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communication technology in terms of positive/negative (good or bad for mankind), or individual/society (heterogenising or homogenising).

Compared to other theoretical tendencies, systemic-type theories demonstrate, in our view, a greater ability to explain complex phenomena, through self-observation of the systems as a fundamental element; the centrality of the communicational component, and the differentiation between system and environment, among other distinguishing features, analysed in this study.

Finally, and to be able to respond to the question of the nature of cyberspace as a system, we have built a Luhmannian map of principles to select those aspects of his thought that would underpin the development of our hypothesis. With this map, we have obtained the following eight conclusions:

1. Cyberspace is a social hypersystem, since it functions as an all-encompassing system (in its technological dimension) and as an environment (communicational, symbolic) of the rest of the social systems, at the same time. We speak of cyberspace as a hypersystem, composed of internal subsystems structurally attached to external subsystems, because as long as it is system and environment at the same time, it self-selects its own irritations and in turn produces other new ones, and generates new selection systems. It is the communication of communication, or second-order communication, since in cyberspace communication is communicated on. This is why we say that complexity that is self-generated until infinity is a second-order complexity ("hypercomplexity").
2. Cyberspace lacks identity and meaning, because it is not a system - it has no environment - but a hypersystem. Therefore, the internal subsystems of cyberspace are the holders of meaning/identity. These subsystems self-generate within cyberspace, not outside, and are thus autopoietic; the multiplicity of the remaining subsystems forms the environment of each of them, which occurs inside cyberspace. For example, a particular community within cyberspace is not the communication of a pre-existing identity outside, but its own subsystem that has emerged within cyberspace, with its own environment, formed by the rest of the subsystems. The system/environment differentiation occurs in the interior of the cyberspace hypersystem.
3. Hetero-references occur between subsystems, but not from the hypersystem to the environment, because it lacks one, since it is all-encompassing and, in itself, the "environment" of the social system. In cyberspace, hetero-reference only exists between subsystems (between communities, social identities created on websites, chats or forums). But the hetero-reference of the hypersystem toward the environment does not exist: it cannot perform hetero-references to which has not been expressed and, therefore, is not likely to be generated by the system.
4. The social system is structurally attached to cyberspace, but not the other way around, because cyberspace is the environment. Since cyberspace is an "environment" for the other social systems, it is these that are structurally attached to the hypersystem, in exactly the same way as with the system of consciousness. For example, and as Manuel Castells points out, it is the company - or any social group- which changes its structures to fit structurally to cyberspace, operatively closed. Cyberspace is not an intermediate space that enables the transfer of information between pre-existing and exterior subjects. It is the subjects who, forming part of the social environment, structurally attach to a hypersystem that is, at the same time, environment and autonomous system.
5. The hypersystem is not teleological, since increasing complexity generates multiple meanings/identities in dissent, and not in consensus. We are speaking of a system in which the human being does not cease to exist, as those who brand Luhmann

anti-humanist would criticise, but is placed in the environment of the system - and therefore, is a constituent element of the system. This is a novelty in sociology. The system, composed of communications that produce more communication, does not have a *telos*, nor can it be transcendental. Cyberspace is not the social provider of the possibility of a Kantian transcendental illusion. Cyberspace does not refer to an objective exteriority, since it itself is all-encompassing and constitutes the environment of the social system.

6. Cyberspace does not create a meaning, because it does not operate as a selector of the irritations of an environment, but is itself an environment from which irritations are selected, both by external systems and internal subsystems. Communication in the core of the hypersystem is not only autopoietic, but also makes possible the autopoiesis of the social system through the construction of meaning. But the social system is, effectively, the space where, through communication, this meaning can occur.
7. In line with this, cyberspace cannot impose themes, since it lacks an environment, and does not function as a selector of irritations. It is the social system and its subsystems (such as, but not only, the media one) which imposes the themes on cyberspace. The ambivalence of cyberspace consists of functioning as a system - autopoiesis, operative closure, self-observation - and as an environment for the rest of the social subsystems. Cyberspace "does not select" the irritations of the system, but selects its own. The selections of the internal irritations cause more irritations, in a process of exponentially increasing complexity.
8. Subsystems maintain, among themselves, a system/environment relationship. In cyberspace, which functions simultaneously as a system and an environment, operative closure rests on this, since cyberspace itself generates its own unlimited complexity. Complexity is produced in cyberspace by its subsystems. Its subsystems are differentiated within the hypersystem of cyberspace, generate their own self-referential meaning, and are constituted as mutual environments. Cyberspace is the possibility of generating all the potential meanings, of all the potential identities.

Applying Niklas Luhmann's systemic analysis, we find that the technological base of cyberspace, what we can call the Internet, presents a distinctly systemic functioning (the network as a system, i.e. a closed set of communicative exchanges with rules for entrance and exit, and a behaviour of structural attachment to its technical environment, through technological adoption and integration), while the social or relational space that we have come to call cyberspace would not have a systemic behaviour, but would function as an environment that contains operatively closed interior subsystems. These subsystems are configured in relation to their internal environment, composed of other subsystems, from which they are distinguished. This is why it is difference, i.e. dissent (and not social consensus) what constitutes them. Difference is what constitutes these subsystems. Consensus (epistemological obstacle) is replaced by dissent.

In summary, cyberspace works in part as a system and in part as an environment. That is to say, it would constitute what we have been referring to as a social hypersystem: an autonomous and technologically self-produced communication system, composed of interior subsystems, but at the same time being the environment of the social system, representing in itself the possibility for the exponential increase in the complexity of this system. In this context it would be interesting to analyse - as future research, since it is not the purpose of this study- which means of reducing complexity would be establishing themselves in the social system to cope with an environment whose complexity increases at

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this rate. It would also be interesting to look at how social systems are performing structural attachment with an environment that is defined by its own constant change.

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