Article

Media Ecology: A Complex and Systemic Metadiscipline

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Abstract: Media ecology is not the theoretical stream of communication studies and it is not limited to Marshall McLuhan´s work and thinking; however, we focus on McLuhan's approach to media ecology for this special issue on the philosophy of Marshall McLuhan. Media ecology is a complex and systemic metadiscipline whose object of study is the changes and effects that have occurred in society as a result of the evolution of technology and media throughout history.

Keywords: media ecology; metadiscipline; complexity; Marshall McLuhan

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1. Introduction

In the first part of the text we explain what the nature of media ecology is and what the object of its study is. We conclude that it is improper to consider it just as "another" theory within the study of communication. Rather, media ecology should be recognized as a complex and systemic metadiscipline that transcends both the science of communication and "McLuhanism". Given that this essay was prepared for the special issue on the philosophical thinking of Marshall McLuhan, we will focus on the media ecology approach that emerged from McLuhan's thinking.

In the second section, a media ecology systemic metadiscipline interpretation of historical time is made, emphasizing the importance of informational rhythms in each historic era.

In the third section, a survey is made of the media ecology and complex systems thinking throughout history, highlighting some features of complex thought present in ancient cultures. From the 16th century, with the success of Newtonian mechanics, science there began a program of reductionism and specialization. The segmentation of science discouraged complexity and systemic thinking. However, the formidable technological development, particularly the development of information technology achieved in the last 60 years, has led to the emergence or, one might say, the re-emergence of systemic and complex thinking. Cybernetics as developed by Norbert Wiener (1981) [1] legitimized the scientific status of complex systemic thinking. Ludwig von Bertalanffy (1976) [2], building on Weiner's work, developed general systems theory in biology. Robert K. Logan (2010) [3] has shown the parallels of media ecology with General Systems Theory. Niklas Luhmann (1988) [4] extended General Systems Theory in the understanding of social phenomena. Lance Strate (2010) [5], a key media ecology thinker, has shown the close links of McLuhan and Luhmann and the deep relationship of media ecology, the general theory of systems and semantics. Finally, in the book *The Laws of Media: The New Science*, Marshall and Eric McLuhan (1988) [6] introduced its tetrad, with

its systemic and complex reasoning, which explains the effects of technological changes in societies throughout history.

2. What Is Media Ecology?

Media ecology is also associated with the "Toronto School", the "New York School", the "School of St. Louis", the "American School of Cultural Studies" and "mediology". However, in each of the mentioned "versions" it is possible to notice certain nuances, and in some cases, open differences in meaning and scope of certain concepts such as "re-mediation", for example. On the website of the Media Ecology Association (MEA) (see http://www.media-ecology.org/), an association founded in 2000 by Neil Postman and Lance Strate, at Fordham University, New York, one can find the definition offered by Neil Postman (1931–2003), a prominent American sociologist and educator:

> Media ecology looks into the matter of how media of communication affect human perception, understanding, feeling, and value; and how our interaction with media facilitates or impedes our chances of survival. The word ecology implies the study of environments: their structure, content, and impact on people. An environment is, after all, a complex message system which imposes on human beings certain ways of thinking, feeling, and behaving. It structures what we can see and say and, therefore, do. It assigns roles to us and insists on our playing them. It specifies what we are permitted to do and what we are not. Sometimes, as in the case of a courtroom, or classroom, or business office, the specifications are explicit and formal. In the case of media environments (e.g., books, radio, film, television, etc.), the specifications are more often implicit and informal, half concealed by our assumption that what we are dealing with is not an environment but merely a machine. Media ecology tries to make these specifications explicit. It tries to find out what roles media force us to play, how media structure what we are seeing, why media make us feel and act as we do. Media ecology is the study of media as environments (see [7]).

Dr. Robert K. Logan (2010), a collaborator of Marshall McLuhan and a member of the second generation of the "Toronto School", presented the following definition of media ecology:

> Traditionally, an ecological system or ecosystem refers to a biological system consisting of a natural physical environment and the living organisms inhabiting that physical environment as well as the interactions of all the constituents of the system. A media ecosystem is defined in analogy with a traditional biological ecosystem as a system consisting of human beings and the media and technology through which they interact and communicate with each other. It also includes the languages with which they express and code their communication (...) Language and technologies mediate and create environments like media. Media and languages are both techniques and tools just like any other form of technology. Media and technologies are languages of expression, which like a language communicate information with their own unique semantics and syntax. Given these overlaps, we claim that the ecological study of media cannot be restricted to narrowly defined media of communication but must also include technology and language and the interactions of these three domains, with together form a media ecosystem (Logan, 2010 [3] (pp. 33–34)).

Fernando Gutierrez, a mexican researcher at Tecnologico de Monterrey in Mexico, and member of the board of the Media Ecology Association, offers the following definition:

> Media ecology is a metadiscipline that deals with the study of a complex set of relationships or interrelationships between symbols, media and culture. The word ecology implies the study of environments and their interrelationships: content, structure, and social impact. A media environment is one that derives from the interrelationships between man and the

different communication technologies such as: books, radio, television and internet. Media ecology is the study of techniques, modes of information and communication codes as the main part of an interrelated environment performing various effects in a given context [8].

Wikipedia attributes to Lance Strate the following definition, cited by Carlos Scolari [9].

Media ecology is the study of media environments, the idea that technology and techniques, modes of information and codes of communication play a leading role in human affairs. Media ecology "is" the Toronto School, and the New York School. It "is" technological determinism, hard and soft, and technological evolution. It "is" media logic, medium theory, mediology. It "is" McLuhan studies, orality-literacy studies, American cultural studies. It "is" grammar and rhetoric, semiotics and systems theory, the history and the philosophy of technology. It "is" the postindustrial and the postmodern, and the preliterate and prehistoric [9].

Wikipedia provides an interesting description of the media ecology and its object of study, explaining the way in which the concept was born, and how it seeks to explain the social changes that have resulted from technologies throughout history:

According to the Media Ecology Association, the term "media ecology" can be defined as "the study of media environments, the idea that technology and techniques, modes of information and codes of communication play a leading role in human affairs". Media ecology theory centers on the principles that technology not only profoundly influences society; it also controls virtually all walks of life. It is a study of how media and communication processes affect human perception and understanding. The term was first formally introduced by Neil Postman in 1968, while the concept of the theory was proposed by Marshall McLuhan in 1964. To strengthen this theory, McLuhan and Quentin Fiore claim that it is the media of the epoch that defines the essence of the society by presenting four epochs, inclusive of Tribal Era, Literate Era, Print Era and Electronic Era, which corresponds to the dominant mode of communication of the time respectively. McLuhan argues that media act as extensions of the human senses in each era, and communication technology is the primary cause of social change. To understand how media effect large structural changes in human outlook, McLuhan classified media as either hot or cool. Hot media refers to a high-definition communication that demands little involvement from audience whereas cool media describes media that demands active involvement from audience. McLuhan with his son Eric McLuhan expanded the theory in 1988 by developing a way to look further into the effects of technology on society. They offer the tetrad as an organized concept that allows people to know the laws of media, the past, present and future effects of media. Media ecology is a contested term within media studies for it has different meanings in European and North American contexts. The North American definition refers to an interdisciplinary field of media theory and media design involving the study of media environments The European version of media ecology is a materialist investigation of media systems as complex dynamic systems [10].

Corey Anton (2006), editor of *Explorations in Media Ecology* at Grand Valley State University, defines media ecology as:

A broad based scholarly tradition and social practice. It is both historical and contemporary, as it slides between and incorporates the ancient, the modern, and the post-modern. ... More precisely, media ecology understands the on-going history of humanity and the dynamics of culture and personhood to be intricately intertwined with communication and communication technologies [11].

Media ecology is challenged by the effects arising from technological development throughout history. The term media ecology was introduced by Neil Postman in a lecture in a ceremony organized by the National Council of English Teachers in 1968. As pertinently remarks Carlos Scolari:

> Postman himself recognized that Marshall McLuhan had used it earlier this decade, specifically in the era of his greatest intellectual brilliance (*The Gutenberg Galaxy* is published in 1962, and *Understanding Media* in 1964) (...) during his lecture, Postman defined the Media Ecology as the study of media as environments [9].

In 1971 Neil Postman founded the "Media Ecology Program" at New York University (NYU). However, Marshall McLuhan has the merit of having previously defined the object of study of media ecology. Technologies (and we must be aware that the media are technologies) affect perception and human understanding, as highlighted by Marshall McLuhan (1996) [12] (p. 39): "The effects of technology do not occur at the level of opinions or concepts but, alter sense ratios or patterns of perception steadily and without any resistance."

It is useful to point out that the effects of any given technology can vary depending on the environment in which that technology is operating. This is explained by McLuhan in terms of his notion of the interaction of figure and ground. The figure of the technology and the impact that it has depends on the ground or environment in which it is operating. The meaning and impact of the printed book is completely different in today's digital environment compared to before the emergence of personal computers and the Internet, and it had a different meaning and impact still before the emergence of the electric mass media of the telegraph, telephone, radio and television.

On the importance of the thought of Marshall McLuhan, in the conception and development of media ecology, Lance Strate said:

> No single individual is more central to media ecology than McLuhan, not because he was the first to employ this perspective, but rather because he popularized it, and produced the first great synthesis of media ecological thought. For some, McLuhanism or McLuhan Studies is sufficient in and of itself, and all the answers can be found in his writings. To others, it was the questions he asked that had the true significance, as he opened up a relatively new field of study, probed uncharted territories, generated excitement, and served as a source of inspiration. For the vast majority, it was this book, first published in 1964, which turned them on to the study of media environments [7].

Media ecology studies the impact of media and technologies on the culture and societies throughout the history. Media technologies produce environments that avoid the easy perception of people. Media ecology is not a theoretical school of communication sciences, as some academics and researchers suppose of this discipline in Latin America. In addition, media ecology is not exhausted by the thought of Herbert Marshall McLuhan (1911–1980). The American and European tradition of media ecology comprises an interdisciplinary approach with the perspective of complex systems.

3. The Interpretation of Historical Time

To validate media ecology as a complex and systemic metadiscipline, first it is essential to emphasize a particular interpretation of historical events, quite different than the traditional Marxian view. Marshall McLuhan raised a different interpretation to understand historical development, based on the recognition of different communication ages: a tribal age; the age of the alphabet; the age of the printing press or the mechanical age of the Gutenberg Galaxy; and the electric age. The book *Understanding New Media: Extending Marshall McLuhan*, Logan (2010) [3] adds two communication ages that were not considered by Marshall McLuhan: the mimetic era of non-verbal communication and the digital age. However, contrary to the contention of Logan, Marshall McLuhan considered a tribal age equivalent to the mimetic age that Logan refers to. In addition, in the book *Understanding Media*, McLuhan anticipated the advent of a "post electric" age, which he appointed with the term "Information Age".

In addition, McLuhan proposed that each historical stage was characterized by a certain "rate of information flow" related to its principal media. In the first age, the tribal age, the flow of information was slow. It took thousands of years to invent the first writing system followed by another 1500 years for the emergence of the phonetic alphabet. With the invention of the phonetic alphabet, the flow of information was accelerated, and the sense of hearing began to be relegated to the background by the sense of sight. In the Late Middle Age, the development of communications and transportation systems increased the speed of the circulation of information, particularly with the printing press that led to the Mechanical Age of the "Gutenberg Galaxy". The sense of sight was relegated even further to the acoustic dimension of communication. In the Mechanical Age it was possible to access information sequentially. The division of labor and the rise of mechanisms were the logical result of an imposed new order. In the Electric Age, beginning with the invention of the telegraph, information circulated even faster. This led to greater complexity. Radio, then television became the main channels of communication in the electric age. In *Understanding Media*: *The Extension of Man*, McLuhan (1964) [13] said that television was the extension of the sense of touch, for it involved all the senses and used the eye as an ear.

The "information age" and "information society" were coined by Daniel Bell (1973) [14] in his book *The Coming of Post-Industrial Society*. Alvin Toffler, in the book *The Third Wave* (1981) [15], introduced the concept of prosumption and predicted the advent of prosumers, the simultaneous producer and consumer of media. The flow of information has been further accelerated in the Information Age with the advent of the Internet, which has led to absolute instantaneous information. Smart phones have accelerated the flow of information even more, making the Internet mobile and with AI, wearables and the Internet of things, information is available everywhere. On the importance of informational rhythms and the complexity of the resulting social organization, McLuhan said:

> The increase of speed from the mechanical to instant electrically reverses explosion in implosion. In the present Electric Age the imploding or contracting energies of our world collide with the old patterns of organization, expansionists and traditionals (...) In fact, creating our concern for the population is not increasing quantities, but the fact is that everyone has to live in closer proximity created by our electric and reciprocal involvement in the lives of others (McLuhan, 1996 [11] (p. 55)).

In historical materialism, the end of history was proposed in the 19th century by Karl Marx and Frederick Engels, who anticipated the emergence of communism and the end of class conflict in society. In contrast, the media ecology does not anticipate the future. Conversely, the future remains open to new technologies that will produce effects in the culture of new societies, definitely much more complex.

4. Media Ecology and Complex and Systemic Thinking

Systemic thinking is one of the major paradigms of knowledge throughout history. It is possible to notice the presence of some of its main features in pre-literate oral cultures. They recognized a holistic world in nature, and began the search for its regularities. They observed the relationships between the elements of their environment and ventured to predict the development of future events based on the recognition of these identified regularities, making use of what McLuhan called pattern recognition.

In the 16th century, systemic knowledge began to be displaced by unidisciplinary specialized paradigms that departed from worldviews that were more simple and stable. The production of specialized accounts that led to disciplinary boundaries began with Francis Bacon (1561–1626) and his *Novum Organon*, published in 1620 [16]; René Descartes (1596–1650), with his *Discourse on Method*, published in 1637 [17]; Thomas Hobbes (1588–1679), with his *Leviathan*, published in 1651 [18]; and Isaac Newton (1642–1727), with his *Philosophiae Naturalis Principia Mathematica*, published in 1687 [19].

However, the formidable technological developments, particularly those achieved in recent decades, made possible the return of systemic and complex thinking. Cybernetics reinstated complex

thought in the scientific imagination. Cybernetics was conceived by Norbert Wiener (1864–1964) [1], a prominent American mathematician who worked at the U.S. National Defense Research Committee program with Vannevar Bush (1890–1974). Bush was largely responsible for this program and is also remembered for the "Memex", the precursor concept of the World Wide Web (WWW). Wiener, who distinguished two stages in the development of civilization, the mechanical age and the electric age, differentiated by the type of instruments used by man (striking similarity to McLuhan), introduced the "cyber" concept in the first edition of the book *Cybernetics or control and communication in animals and machines*:

> "Until very recently there is a voice that understood that set of ideas; to express everything through a word, I was forced to invent it. From there: cybernetics, resulting from *kubernetes*, Greek word, or helm, the root of which people of the West have formed government and its derivatives." (Wiener, 1981 [1] (p. 17))

About Wiener and the origin of cybernetics, Mattelart (2002) [20] (p. 59), one of the main critics of Marshall McLuhan, noted:

> In 1948, Norbert Wiener (1894–1964) publishes *Cybernetics or control and communication in animals and machines.* This work, in which observation of physiological processes and neurophysiological monitoring (heart muscle contraction, benefits the nervous system as an integrated whole) and formalization of a general theory of technological control systems gets intersect, is the starting point for pilotage or science cybernetics.

Wiener introduced the concepts of feedback, and "amount of information" in the emerging Theory of Communication. Wiener first made a distinction between analog and digital machines. In the book *Cybernetics and Society*, Wiener (1981) [1] (p. 19) defined the role of "information", incorporating in its definition the term "complexity":

> We give the name of the content information which is the subject of trade with the outside world, as we adjust to it and make that fits us. The process of receiving and using information is to adjust to the contingencies of our environment and living effectively within it. The needs and complexity of modern life posed to this phenomenon demands more intense exchange of information at any other time; the press, museums, scientific laboratories, universities, libraries and textbooks have to meet them or fail in its purpose. Live effectively it means having the right information. Thus, communication and regulation constitute the inner life of man, and their social life.

Building on Wiener's contributions, Claude Elwood Shannon (1948) [21], considered "the father of Information Theory" [22], published in two parts the article "A Mathematical Theory of Communication" in the Bell System Technical Journal. Shannon together with Warren Weaver developed a model of information and its communication which introduced a mathematical formula for information and concepts such as source, message, transmitter, signal, channel, noise, receiver, destination, error probability, encode, decode, route information and channel capacity. Shannon and Weaver were also critiqued by some academics and researchers in communication sciences in Latin America, who stigmatized them as authors of mathematical information theory, and precursors of the structural-functionalist paradigm.

In 1934, the systemic paradigm was re-introduced by Ludwig von Bertalanffy [2], the Austrian biologist and philosopher, under the name of General Systems Theory. The title was possibly inspired by the book Foundations of the Theory of Signs, authored by engineer Charles William Morris (1985) [23] in 1938, and the influence of Alfred Korzybski (1994) [24], who introduced the Theory of General Semantics in 1933.

Bertalanffy's proposals were crucial for the Systemic Paradigm which stands today as an obligatory reference model of interdisciplinary projects in the sciences, humanities and social sciences. General Systems Theory

states that the properties of the systems can't significantly be described in terms of its separate elements. The understanding of systems occurs only when they are studied globally, involving all the interdependencies of its parts. The three basic premises are: the systems exist within systems, the systems are open and the function of a system depends on its structure [25].

In General Systems Theory (GST), it is essential to develop tools to supplement specialized disciplines. By no means does GST disqualify individual disciplines. Essentially, GST affirms the need to transcend the expertise to access a broad and comprehensive perspective as reality. GST further comprises a specific methodology for global action, which supplements and corrects models and methodologies for specialized disciplines.

In the 1970s, the systemic paradigm was incorporated by Niklas Luhmann (1998 and 2006) [26] in his work. He understood the necessity of extending the explanatory scope of GST to the analysis of societies. This led to a disagreement with Jürgen Habermas (1929) [27], one of the last intellectual heirs of the Frankfurt School. Luhmann argued that social systems tend to disorganize depending on the degree of entropy. Social systems are maintained in accordance with the changes established with the environment, from which they receive information and energy necessary to stay organized and persist. Living things get the environment to assimilate food and convert it into energy that keeps them alive. Similarly, social systems remove information from the environment they assimilate and this information becomes a key factor in their development. The information allows them to organize.

Luhmann's theory rests on the concept of communication. According to Luhmann, the constituent units (breeding of social systems) are communications, not individuals. Society is a type of social system comprising all communications. Communication is not a human action, not a technological phenomenon, nor an exchange of information. Men cannot communicate. Only communication communicates. Luhmann's general systems theory asserts its claims to universality, claiming its applicability in all social phenomena as is suggested by Emilio Gerardo Arriaga Álvarez:

> The Luhmann's theory has, instead, powerful analytical tools for understanding the functioning of society, subsystems and organizations. Mechanisms for reducing the complexity, the codes of the various subsystems, the binary selection schemes and regulation of relations within each subsystem and exchanges between them, are rigorously scrutinized. So the conceptual apparatus is emerging as a very suitable to the characteristics of modern society vision, and the processes that occur at different levels [28].

Complexity does not represent a difficulty for a social system. By contrast, it is a prerequisite for its development. Systems arise from the process of reducing complexity. Systems are less complex than their environments and their limits are not physical, they are of meaning. To Luhmann, function precedes structure. Luhmann defined its position as a functional-structuralism, thus distinguishing the structural functionalism of Talcott Parsons (1951) [29].

Luhmann claimed that social systems use language as a membrane to take from the environment the information necessary to properly codify it. Lance Strate understood the close relationship between McLuhan and Luhmann, and hence media ecology, General Systems Theory, and General Semantics:

> McLuhan (2003) argued that language is a form of perception, indeed, that languages are organs of perception. And to Luhmann (1982, 1989, 1995, 2000), both, perception and language, contribute to the maintenance and running of the limits of self-organizing social systems (Strate, 2010 [5] (p. 35)).

On the systemic perspective of McLuhan, Lance Strate argues that the metaphor "galaxy", which Marshall McLuhan used in the title of *The Gutenberg Galaxy* [30], can be considered as synonymous with systems thinking (Strate, 2004 [31] (p. 6)). Strate, rightly, points out that the book *Laws of Media (LOM): The New Science* (McLuhan and McLuhan, 1988) [6] fully affirms the systemic perspective of Marshall McLuhan's media ecology. It represents the perfect conclusion of the fruitful intellectual

work of Marshall McLuhan. The LOM or tetrad comprises four laws that can be applied to all the artifacts of humankind, tangible and intangible, abstract or concrete. The four laws are based on the following questions about the impact of the media and the cultural ecology medium in societies: What does a medium or technology extend? What becomes obsolete? What is recovered from the past? What does it reverse into when pushed to its extreme? The LOM synthesize the systemic approach and complex thought of McLuhan. The graphical representation of the LOM is shown in Figure 1.
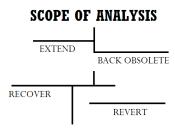
SCOPE OF ANALYSIS

EXTEND

BACK OBSOLETE

RECOVER

REVERT

Figure 1. McLuhan scheme (tetrad). Source: Federman and De Kerckhove 2003 [32] (p. 103).

The first law of the tetrad indicates that all technology extends a physical or mental faculty of man. We must remember that the concept of extension implies the possibility to extend, replace, increase, enhance, accelerate, and intensify. The second law, which corresponds to obsolescence, represents the replacement of the old artifact with the new one. According to McLuhan, technologies extend but also amputate. In amputations, technological changes are inevitable. While certain senses or faculties increase, others will inevitably decrease. The core concept of the third law is retrieval, which is numbness. The social structure suffers the effects of any new technology and gradually regains its balance. Sometimes recovery is a result of adaptations. The fourth law is defined by reversal. When technology reaches its limit, which in McLuhan's terms means over-heating, the situation reverses itself and a new artifact emerges.

5. Conclusions

Media ecology, as well as General Systems Theory, admits to being considered as a metadiscipline and a way of thinking that is both complex and systemic [33]. Media ecology, which studies the effects of technology on the culture of societies throughout history, needs to involve a wide range of sciences such as grammar, rhetoric, semiotics, systems theory, history, philosophy, cybernetics, communication sciences, arts, literature and, of course, technology itself. The media ecologist is a historian, an anthropologist, a man of letters, a scholar of general semantics, and a philosopher who analyzes the changes that occur in technology companies. The object of study of media ecology is a simultaneous semantic, ecological and historical complex approach.

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