

Actor-network theory, journalism and hacker culture: for beyond the black boxes of digital artifacts in the journalism process

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ABSTRACT: The role of technology has been thoroughly discussed in journalism studies, but little has been said about digital artifacts as active participants of production process in the journalism. This article searches for a approximation to the objects in the journalistic process from the approach of actor-network theory (ANT), which claims not to be possible to understand the mediation without regard to materiality and the "non-human" objects, as says Bruno Latour (1992) and Michel Callon (2008), some of the principal researchers from ANT. For this, we seek to briefly initially rescue the role of objects in historical phases of journalism pointed out by Ciro Marcondes Filho (2009), and discuss the mediation in journalism studies in the 20th century. After, we brings the ontological contribution of actor-network theory and the visibility it can give on the association between all actors involved in the journalistic production, following the path of other studies that seek this approach, as Couldry (2004), Plesner (2009), Holanda and Lemos (2013), Arce, Alzamora and Salgado (2014) and Primo and Zago (2015), that "journalism isn't produced solely by the social relations among editors, journalists and sources, but also by non-humans actants (such as e-mails, softwares, search engines, socials networks, among others), which participate in the process, transforming it, as Plesner (2009) says. We argued that the active role of digital artifacts can be better realized in practices like data journalism, specially when occurs a approximation to journalism and the hacker culture, from the contribution of several essential elements of a hacker ethics detailed

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by Pekka Himanen (2002) - such as transparency, openness, sharing knowledge with other people who can benefit from it and the decentralization of working process - for the professional culture of data journalists. These contributions toward a demystification of the "black boxes" of digital artifacts, specially those to be used in news process of production, a prospect that the ontological approach also enhances the ANT.

KEYWORDS: journalism - actor-network theory - mediation - objects - technology

1. INTRODUCTION

The changes in the way people communicate, caused mainly by the development of new technological devices, are one of the most important issues to be studied in this twentieth century. The development of nanotechnology led to the increasing miniaturization of digital devices, and these, from the rise of the Internet, began to communicate with each other in ways never before possible - including talk without direct human interference, the so-called "Internet of things. The result is that was not only a transformation in the way they communicate as *whom* communicates, and "smart" objects become even more seen as also part of this communication process.

This fact has been accompanied in recent years of a resumption of thinking about the role of materiality in communication processes. Felinto (2013, p.15) says that is the convergence of observation modes that come to rethink the role of artifacts in the apprehension of reality communication. A "non human turning point" (Felinto, 2014, online) that has its roots in the thinking of theorists used by the communication as Walter Benjamin, Martin Heidegger and Marshall McLuhan that has been updated today by prospects such as the materiality of communication, and setting up a paradigm non-hermeneutic (GUMBRECHT, 2004), new forms of materialism (BENNET, 2010) the restructuring of the agency notion (LATOUR, 2012) - this last, one part of the ontological contributions that the Actor-Network Theory (ANT) brings to the understanding of reality

The Actor-network theory contributions provide an important repertoire for the reconfiguration of agent in a communicative action and also for the understanding of mediation today. To bring the idea that one can not understand the communication process without taking into account the materiality and non-human objects (CALLON, 2008), the ANT can also help us understand the role of objects in journalistic mediation, a notion that has been set aside in

journalism studies by a adoption a deterministic perspective of what journalism should be, and not what reality shows that it is (PRIMO & ZAGO, 2015). The result is that these studies turn out to ignore the multiple mediations that has crossed the journalistic mediation (ARCE, ALZAMORA, SALGADO, 2014), especially with the advent of the internet and the active role that non-human objects can have in the production of the news, from the objects used in the editing of newspaper (KEITH, 2015) to the content management systems (RODGERS, 2015) and the objects used by a muckraking investigations called 'annotative journalism ' (GRAVES, 2015).

We believe, along with Couldry (2004), Plesner (2009), Holanda and Lemos (2013), Arce, Alzamora and Salgado (2014) and Primo and Zago (2015), among others, that journalism is not produced "solely by the 'social relations' among editors, journalists and sources, but also by non-human actants (such as e-mail) which participate in the process, transforming it". We concluded bringing the hacker ethic (HIMANEN, 2002) to dialogue with the role of objects in journalistic' mediation and a possible contribution of free software and hacker culture philosophy to the permanent opening of the black boxes.

2. TECHNOLOGY AND JOURNALISM: A BRIEF HISTORIC REVISION

The history of journalism is closely linked to the development of technology. Even before the existence of journalism as it is known today, the task of reporting information to varied audiences was related to technical objects non humans, since the official notes of the Roman Empire carved into the stone until the invention of the press by Gutenberg (1447), landmark of human history which allowed printing on an industrial scale which, in turn, would allow, in the seventeenth century, the emergence of the first newspapers giving rise to what we now call journalism (MARQUES DE MELO, 2003; TRAQUINA, 2005). Technologies such as rotary press, the telegraph, the camera, telephone, radio, television, computers, the Internet and smartphones, among others, would, in that order, co-responsible for the transformation of journalism throughout its four centuries of existence, from the first pre-industrial setting to the connected journalism and post-industrial (ANDERSON, BELL, SHIRKY, 2013) today. We rescue here, for now briefly³, some points of that relationship with journalism and technology by a historical division into four periods made by Marcondes Filho (2009). We emphasize that,

³ This historical relationship will be more detailed in ongoing doctoral research of Leonardo Feltrin Foletto, to be completed in 2016.

rather than stipulating a fixed date, these periods divided by technological inventions shows changes in society and are used here more to to organize our thought than to establish rigid divisions.

The First journalism appointed by the author begins from the French Revolution (1789) until the period of the expansion of the printing presses, wherein the more ability to print pages per minute favors the expansion of journalism as a business (1830-1850). It is the "lighting journalism", direct heir to the ideal of transparency arising from the French Revolution, the period in which the printed pages has the function of a "speaker" for political and literature ideas. It is the time in which printing machines, in the hands of an intellectual and political elite, propagating ideas with educational and policy formation without commitment to be faithful to a truth of the facts.

The early nineteenth century sees various of changes caused by the bourgeois revolution and its ideals of freedom. The industrial revolution enables the development of printing technologies, which to produce more pages per minute will foster the development of journalism as a capitalist enterprise - or would be the biggest capacity of printing machine a demand of newspapers competing with each other by attraction the reader? The truth is that technological developments facilitate the expansion of the newspaper as a medium of mass, and this is a mark from beginning of the Second journalism, says Marcondes Filho (2009). The machine of Koenig in 1814 brings important changes regarding from the press of Gutenberg: two cylinders rotary running with power steam (and not only mechanical, like the previous one), which allowed the 1100 pages/hour printing, against the 500 pages/hour from the first press machine. The rotating of Marinoni in 1871 increases this capacity to 95,000 pages/hour, establishing the era of large print runs. The telegraph (1844) enables the transmission of news over long distances, first among the countries of Europe and the United States in the 1850s and 1860s, and then between Europe and China, Japan and South America (TRAQUINA, 2005). The photogravure (1851), photography and, later, the phone (1876) will definitely help transform journalism into a professional business that should be self-sustaining and make a profit by selling advertising space (MARCONDES FILHO, 2009, p.21).

Under the influence of the paradigm of modernity, in this period it is defined the characteristics still today identified with journalism: the news, the search for truth, independence, impartiality, the notion of public service and especially the idea of objectivity. Under this vision, the idea of that technical objects share responsibility for journalism production become obscured by the

pursuit of the ideal of objectivity; is the prevalence of neutrality of the technique, the thought that the objects do not interfere in the action of making news - they are only instruments for production of news as faithful as possible to reality.

The idea of neutrality of the technique also remains on the Third journalism (1900-1960), when newspapers become media groups, absorbing various media and publications. In this period shows the radio (1920) and television (1925), that during and after the II World War, respectively, popularized and established a new relationship between news organizations and their audiences, with the invention of broadcast journalism (PRIMO & ZAGO, 2015). It is in this period that also develops the advertising industry and public relations as new forms of communication that go to compete with journalism (MARCONDES FILHO, 2009).

The last period of the division by Marcondes Filho, the Fourth Journalism, occurs from the invention of computers and the development of digital technology, in 1970 and 1980, to today. There are two main moments of these transformations: the first from the 1970s, when computers are now used not only in information storage - as occurred in some cases since 1952 (COX, 2000 cited PRIMO & ZAGO, 2015) - but in newsrooms, replacing the typewriter (SMITH, 1980; BALDESSAR, 2003). And the second is in the mid-1990s, with the rise of the commercial Internet, which causes the *mediamorphosis*, "a transformation of the media, usually caused by the complex interweaving of perceived needs, policies and competitive pressures and social and technological innovations "(FIDLER, 1997). This occurs when the computer has a central role in the four stages that characterize digital journalism (MACHADO, 2006): newsgathering, production, circulation and consumption. We argue that in this period it is more necessary than never to question the dominant perspective on the journalism studies about what would be the mediation and the role of objects in this process, the two themes of the next section.

3. THE OBJECTS AND THE JOURNALISTIC MEDIATION

A brief historical recovery we made in the previous section explains some of the important objects in the history of journalism. It also helps us to understand why they have been little remembered as actors directly involved in journalistic mediation, either within journalism studies and within the newsroom. There are several explanations for this decrease in the importance of the objects, but perhaps the most obvious clue is the predominant bias used in

defining what is mediation in journalism. From the perspective of Mirror Theory, predominant perspective influenced by the positivism in the late nineteenth century, that sees journalist as a disinterested mediator who makes known the world as it presents itself, undistorted, to the *gatekeeping*, since the 1950s saying where the journalist is the one who selects and ranks the news, the prevailing view has been that focused on human action, which leads to consider the objects as accessories that little or nothing interfere in professional practice.

That perspective comes from the fact that journalism is a legitimate child of modernity of the nineteenth and twentieth century. As Marcondes Filho (2009) says,

"Journalism is a synthesis of the modern spirit: the reason (the " truth ", transparency) imposing itself against the obscurantism tradition, the questioning of all authorities, criticism of the policy and the unrestricted confidence in progress, the continuous improvement of species; (MARCONDES FILHO, 2009, p.17)

The characteristic ideals of modernity are the ideals found in journalism established in the late nineteenth century and early twentieth century: the search for truth, impartiality and - specially - the objectivity. The objectivity was established initially as a business strategy for the professionalization of journalism, in opposition to partisan newspapers of the "First journalism" (SCHILLER, 1981; DEMENECK, 2009). It is the objectivity that will direct the journalistic activity throughout the twentieth century and guide the understanding of what constitutes mediation in journalism.

In this period, Walter Lippmann, in *Public Opinion* (1922), defends the use of procedures near of the scientific method in journalistic practice in looking for a method that aims at ensuring objectivity in journalism. Because this, it will be initiated, especially in the United States of the 1930s, an era of professionalization of journalism, which established the editorial policy of institutionalization organizational as an attempt to "approach to the objective fact" (SCHUDSON, 1978, p. 152).

The journalistic mediation that derives from this perspective is one that the produce of news must be as close as possible to the fact . In it, both the journalist, - now professionalized and trained at the University - and the newspaper company, a structured business enterprise, become privileged mediators, selecting what must or must not be a news, like in theory of *gatekeeping*. Or become state apparatus in building a consensual and standardized reality, as is the case of the media in structuralist approaches such as Stuart Hall (cited TRAQUINA,

2005). In the constructionist theory, especially in Berger and Luckmann (2008), the news is not mirrors of reality, but built on a reflective movement that recognizes the existence of different mediations in the journalistic mediation process. Although it is an approach that recognizes the existence of different elements in the production of news, from the language to the organizational structures of newspaper companies, the central position of journalism in the mediation continues to predominate in this understanding (ARCE, ALZAMORA, SALGADO, 2014).

Interactionist theories proposed by Tuchman (1973) and Moloch and Lester (1974 cited in TRAQUINA, 2005), among others, complexified the understanding of the journalistic mediation to say that the news are the result of "processes of perception, selection and processing of events by relatively autonomous professionals, guided by a common culture, but under pressure of the time factor "(ARCE, ALZAMORA, SALGADO, 2014). Moloch and Lester (1974) say that there are three types of subjects in interaction (news promoters, journalists and news consumers) - and here we have a another understanding that disregards objects and the technology as one of participants in the mediation that produces the news.

With the development and popularization of the Internet in the 1990s, all the people with an access to the internet and minimal capacities to use the computer can produce and publish information. It enhances the intersection of another forms of mediation with the journalistic mediation and question the idea of typically modern and purifying mediation, opening way to consider mediation as a hybrid process, unstable and consists of several elements set out in a network of meanings (LATOUR, 1994a).

This is the time that we return to the question we asked at the beginning of this article: in a society increasingly mediated by the action of non-human objects, would not be the time to bring them into the discussion of journalistic mediation? We believe it is from this point that ANT can contribute to the reconfiguration of journalistic mediation and (re) making the importance of technical objects in this process, what we will explain below.

4. THE ACTOR-NETWORK PERSPECTIVE TO DISCUSS THE JOURNALISM

Originated in studies of the sociology of science and technology, the Actor-Network Theory (ANT) arises in the 1980s as alternative perspective to the structuralist and functional conceptions of science. These offer social explanations, based on simplistic relations of

causes and effects caused by the isolated social "phenomenon" to be analyzed, or essentialist explanations, centered on the phenomenon to be analyzed without considering its social, economic, cultural, etc. In opposition to these conceptions, researchers like Bruno Latour, Michel Callon, Madeleine Akrich and John Law, among others, began to defend the idea that the scientific and technical innovations must not be thought separately from the context in which they operate and from the actors involved in its production. So, the ANT authors propose a "sociology of mobility", where the explanations of social phenomena start to occur in the flow on the network in circulation among the actors involved, be they human or nonhuman.

For Lemos (2013), the ANT proposes that the social sciences should devote attention to "to the dynamics of the formation of associations, movements of assemblages, distribution of action between different actors, human and nonhuman, from a symmetry widespread"⁴ (LEMONS, 2013, p.37). It is a perspective that seeks to question the social as something stable, which can be explained through fixed analyzes that separate the elements involved - the social as something different from the scientific, the place as different from the context of a laboratory where the action occurs, as exemplified Latour in one of his first work, "The life of laboratory: the production of scientific facts"⁵. When the ANT investigates the phenomena like movements, it will be interested by all actors involved in this action, and thus will leave to analyze only the results of an isolated science. As explained by Latour (2000),

"We will not try to analyze the final products, a computer, a nuclear plant, a cosmology theory, the shape of a double helix, a box of contraceptive pills, a model of economy; instead we will follow scientists and engineers at the times and the places where they plan a nuclear plant, undo a cosmological theory, modify the structure of the hormone for contraception, or disaggregate figures used in a new model of economy. We go from final products to production, from 'cold' stable objects to 'warmer' and unstable ones" (LATOURE, 2000, p.21)

For conception a theory that want to analyze the movements of the actors, the network⁶ idea becomes essential. According to Lemos (2013, p.35), "Network is the association in

⁴ This note and others from Lemos is a translation from portuguese made by us.

⁵ Written with Steve Woolgar, the book is a resulted from a ethnography of two years in the laboratory from Roger Guillemin, La Jolla, California. For more information about the book: <http://www.bruno-latour.fr/node/218>

⁶ In times of hyperconnection, it's necessary differentiate the network idea presented by Latour from the social networks, telecommunication networks; "It's not where things pass, but what that forms in the relationship" as writes Lemos (2013, p.54).

movement, the social in movement"; the actor is the network, the association is the network, and is on the look for the traces left by these networks with a thousand actors that the ANT will analyze the phenomena and propose their understanding. The social is not only the explanation for a given phenomenon, but what emerges from the associations of networked actors, the between for various expanded points seen in a continuous movement perspective where everything should be considered - and here's the way from the idea of "sociology of mobility"; it is only in space and time of action and interaction in movement that the society happens. How explains Latour (1994b): "Society itself is constructed only through such quotidian interactions. However advanced, differentiated, and disciplined society becomes, we still repair the social fabric out of our town, immanent knowledge and methods" (LATOUR, 1994b, p.60).

From the anthropological observation of networks which are the scientific discoveries, for example, the ANT goes to emphasize the role of materiality in the production of an action: the production of scientific knowledge can not be understood without the technical objects. So "the action and knowledge are not located in the human brain, but are distributed in non-human material devices" (CALLON, 2008, p. 303). In this point where it enters one of the most controversial issues when talking in ANT, because it looks for the objects in association with humans to saying they act - and his action is that perhaps we can better understand the extent of their associations in society.

Here is presented the principle of symmetry (or flat ontology), the idea that subjects and objects have the same importance. In this question, according to Lemos (2013, p.52), which ANT distinguishes from other studies of science and technology. As explained by Callon (2008, online), the idea of giving the same importance to both come as opposed to a distinction historically marked with the modernity, "the conviction according to which there are two categories of entities in the cosmos, humans and other "(CALLON, 2008, online). The ANT option for "inclusion" of objects on a par with humans in the analysis calls attention to the discussion of the two issues we are working on this article: mediation and the technical objects in the journalism. In proposing the analysis of all the actors in the network of a given phenomenon, the TAR - and particularly Latour (1994b) - emphasizes mediation as a "action program": "the series of goals and steps and intentions, that an agent can describe "(LATOUR, 1994 b, p.31).

When we bring this conception of mediation from ANT for (re) configuration of journalistic mediation, it is clear why the inclusion of technical objects in the analysis. They, like humans,

are all currently participating in multiple and unstable mediations occurring in society and also in journalism. A fenced world of technical "smart" objects as today, in that the digital technology is a reality in all processes of news production (MACHADO, 2006), they aren't accessories mediators for a privileged journalist. Study them from this point of view is reveal the complexity rendered invisible because the digital objects are now "as naturalized in newsrooms as the taxi is to taxi driver" (PLESNER, 2009).

Is in this way, to opening the black boxes and display of multiple and unstable mediations that cross and form the journalistic mediation on the internet today, that we go to our conclusion, searching for a relation with this conception of ANT to a digital journalistic practices influenced by the hacker culture originated with the internet.

5. BLACK BOXES AND AN APPROXIMATION WITH A CULTURA HACKER

In "Hackers - Heroes of the computer revolution" (1984), Steven Levy was the first to examines the period from 1958 to 1984 and say that the first hackers have emerged from the 1950s, in the Massachusetts Institute of Technology (MIT), and then in California, where teachers and students began using the term to describe people with great technical skills in computer science, who learned by doing, through practice, and became excellent programmers and system developers, but often bad students in the university. These early hackers determine the establishment of an ethical hacker (HIMANEN, 2002), whose precepts are "all information should be free, information sharing is positive, free access to all software codes and everyone has access to information and technological resources "(HIMAMEN, 2002; CHRISTOFOLETTI, 2008).

With the popularization of the Internet in the early 1990s, the hacker becomes an important character in the digital world, identified by Manuel Castells as one of the four layers of the culture of the Internet - the other three would be the scientists (the techno-meritocratic), the virtual community and the business (CASTELLS, 2002, p. 34-35). The hacker culture will begins the free software movement⁷, a key player in the ideology of freedom widely circulated

⁷ The free movement was created by Stallman in order to obtain and guarantee certain freedoms for software users, namely: the freedom to run the software, to study and modify the software, and to redistribute copies with or without changes. Although based on traditions and philosophies among members of the 1970s hacker culture, Richard Stallman formally founded the movement in 1983, with the launch of the GNU Project - which, years later, it was a basis for foundation of Linux, today the most widely used free operating system. In 1985, Stallman created the Free Software Foundation (<http://www.fsf.org/>) to support the movement and defend freedom in the network.

on the Internet, and will approach of journalistic practice, especially in the datajournalism (TRÄSEL, 2013).

To open the "production code" and defend the idea of transparency in information sharing, what the hacker ethic generates is an understanding of how these traces are left and how they may (or may not) be processed and shared. It facilitates the technical knowledge of these trails to show them how they are made - which are the command lines and programming languages used in the specific case of software- and ensures that others also have this access, which further strengthens the understanding collective about running applications in the case of software, actions and also of non-human objects, when philosophy is employed in the construction of objects such as a smartphone or a tablet. Opening the source code of a software allows creating more disputes to stabilization in black boxes, that is one of the goals when ANT shows what is invisible and your weave of meanings possible. They will further enhance the movement and the look about the mediations - that which produces action, translation, circulation (LEMOS, 2013, p.64). As Latour says (1994b): "essence is existence and existence is action" (LATOUR, 1994b, p.33)

The approach of the ethical hacker in journalism can, in our view, help to open the black boxes of journalistic mediation, "safely protected by sacred conceptions, such as ideology, truth, objectivity. In particular, it helps in the understanding of how the technical objects used in the production of news. By opening this "black box" and scrutinize the details of its operation, which is observed, as well as ANT postulates, is that "the social" is as technical, as "the technical" is social (COULDRY, 2004). For the journalism means that it's not a tag may be attributed to some texts, images, videos and audios. Instead, it is a momentary process that happens while specific associations are maintained. Journalism is not only what journalists do, but *happens* in moments from the joint and temporary mediation - of human and non-human.

BIBLIOGRAPHY

ARCE, Tacyana; ALZAMORA, Geane; SALGADO, Thiago Barcelos Pereira. *Mediar, verbo defectivo: contribuições da teoria ator-rede para a conjugação da mediação jornalísticas*. In: Revista Contemporânea, v.12, nº03, set-dez 2014, p.495-511.

ANDERSON, C. W; BELL, Emily; SHIRKY, Clay. *Post-Industrial Journalism: Adapting to the*

Present. Nova York; Tow Center for Digital Journalism - Columbia University, 2013.

BALDESSAR, Maria José. *A mudança anunciada: o cotidiano dos jornalistas com o computador na redação*. Florianópolis: Insular, 2003.

BERGER, Peter; LUCKMANN, Thomas. *A construção social da realidade*. 28.ed. Petrópolis: Vozes, 2008.

CALLON, Michel. *Entrevista com Michel Callon: dos estudos de laboratório aos estudos de coletivos heterogêneos, passando pelos gerenciamentos econômicos*. Sociologias no.19 Porto Alegre Jan./June 2008. Available in: http://www.scielo.br/scielo.php?pid=S1517-45222008000100013&script=sci_arttext#end02 Acesso em: 18 fev. 2014

CASTELLS, Manuel. *A sociedade em Rede – a era da informação: economia, sociedade e cultura* – Volume 1. São Paulo: Paz & Terra, 2002

CHRISTOFOLETTI, Rogério. *Ética no jornalismo*. São Paulo; Contexto, 2008.

COULDRY, Nick. *Actor Network Theory and Media: Do They Connect and on What Terms?* In: *Connectivity, Networks and Flows: Conceptualizing Contemporary Communications*, edited by A. Hepp, F. Krotz, S. Moores, and C. Winter, 93–111. Cresskill, NJ: Hampton Press, 2008.

DEMENECK, Ben-hur. *Objetividade jornalística: o debate contemporâneo do conceito*. Master dissertation - Universidade Federal de Santa Catarina, Brasil, 2009. Available in: <https://repositorio.ufsc.br/handle/123456789/93112>

FELINTO, Erick. *Meio, Mediação, Agência: a descoberta dos objetos em Walter Benjamin e Bruno Latour*. E-Compós, Brasília, v. 16, p. 1-15, 2013.

_____. *Entrevista: A descoberta dos objetos e a experiência de uma “virada não-humana”*. 2014. Available in: <http://www.ihuonline.unisinos.br/index>. Acesso em: 10 ago. 2014

GRAVES, Lucas. *Blogging Back then: Annotative journalism in I.F. Stone's Weekly and Talking Points Memo*. Journalism, vol. 16 (1), 99-118, 2015.

GUMBRECHT, Hans Ulrich. PFEIFFER, Karl Ludwig. *Materialities of Communication*. Stanford; Stanford University Press, 1994.

_____. *The Production of Presence: What Meaning Cannot Convey*. Stanford: Stanford University Press, 2004.

HIMANEN, Pekka. *La ética del hacker y el espíritu de la era de la información*. Tradução de Ferran Meler Ortí. Barcelona: Destino, 2002.

KEITH, Susan. *Horseshoes, stylebooks, wheels, poles, and dummies: Objects of editing power in 20th-century newsrooms*. Journalism, vol. 16 (1), 99-118, 2015.

LATOURE, Bruno. *Jamais Fomos Modernos*. Trad. Carlos Irineu da Costa. Rio de Janeiro; Editora 34, 1994(a).

_____. *On Technical Mediation*. Common Knowledge, Vol. 3 n. 2, p. 29-64, 1994(b).

_____; WOOLGAR, Steve. *A vida de laboratório: a produção dos fatos científicos*. Rio de Janeiro: Relume Dumará, 1997.

_____. *Ciência em ação: como seguir cientistas e engenheiros sociedade afora*. Trad. Ivone C. Benedetti. São Paulo; Editora UNESP, 2000.

_____. *Reagregando o Social: uma introdução à teoria do ator-rede*. Trad. Gilson César Cardoso de Souza. Salvador; Bauru: EDUFBA; UDUSC, 2012.

LAW, J. Notes on the *Theory of the Actor-Network: Ordering, Strategy and Heterogeneity*. Systems Practice, v. 5, p. 379-393, 1992.

LEMOS, André. *A comunicação das coisas: Teoria Ator-Rede e Cibercultura*. São Paulo: Annablume, 2013.

LEVY, Pierre. *O que é virtual?* São Paulo; Editora 34, 1997.

LEVY, Steven. *Hackers: Heroes of the computer revolution*. New York, Penguin Books, 2001.

LAW, J. *Notes on the Theory of the Actor-Network: Ordering, Strategy and Heterogeneity*. *Systems Practice*, v. 5, p. 379-393, 1992.

MACHADO, Elias. *O Jornalismo Digital em Base de Dados*. Salvador; Calandra, 2006.

MARCONDES FILHO, Ciro. *Ser jornalista: O desafio das tecnologias e o fim das ilusões*. São Paulo; Paulus, 2009.

MARQUES DE MELO, José. *História social da Imprensa: fatores socioculturais que retardaram a implantação da imprensa no Brasil*. Porto Alegre; EDIPUCRS, 2003.

PLESNER, Ursula. *An Actor-Network Perspective on Changing Work Practices: Communication Technologies as Actants in Newswork*. *Journalism* 10 (5): 604–626, 2009.

PRIMO, Alex. ZAGO, Gabriela. *Who and what do journalism? An actor-network perspective*. In: *Digital Journalism*, 2015; vol.3, nº1, p.38-52. London; Routledge, 2015.

RODGERS, Scott. *Foreign objects? Web content management systems, journalistic cultures and the ontology of software*. *Journalism*, vol. 16 (1), 10-26, 2015.

SCHILLER, Dan. *Objectivity and the News: the public and the rise of commercial journalism*. Philadelphia: University of Pennsylvania Press, 1981.

SCHUDSON, Michael. *Discovering the news: a social history of American newspapers*. Basic Books, 1978.

SMITH, Anthony. *Goodbye Gutenberg. The revolution of newspaper in 1980's*. Nova York: Oxford University Press, 1980.

TRAQUINA, Nelson. *Teorias do Jornalismo: Porque as notícias são como são - vol.1* Florianópolis; Insular, 2005.

TRÄSEL, Marcelo. *Jornalismo guiado por dados: relações da cultura hacker com a cultura jornalística* . Artigo apresentado no XXII Encontro Anual da Compós, Universidade Federal da Bahia, 2013(b).

TUCHMAN, Gaye. *La producción de la noticia: estudio sobre la construcción de la realidad*. México: Ediciones G. Gili S. A., 1983. Título original: *Making news – a study in the construction of reality*, 1978.