e-ISSN nº 2447-4266
Palmas, v. 11, n. 1, 2025
http://dx.doi.org/10.20873/uft.2447-4266.2025v11n1a15en

A HISTORICAL-CONCEPTUAL RETRIEVE OF AUTOMATION IN JOURNALISM: a look from the Actor-Network Theory

UM RESGATE HISTÓRICO-CONCEITUAL DA AUTOMAÇÃO NO JORNALISMO: um olhar a partir da Teoria Ator-Rede

UNA VISIÓN HISTÓRICO-CONCEPTUAL DE LA AUTOMATIZACIÓN EN EL PERIODISMO: una mirada desde la Teoría del Actor-Red

Fernanda Vasques Ferreira
PhD in Communication. Professor at the University of Brasília and the Graduate Program in Communication at UFMT.
0000-0003-4242-0057

Marco Aurélio Boselli
PhD in Physics. Professor at the Federal University of Uberlândia.
0000-0002-1030-1144

Cristóvão Domingos de Almeida
PhD in Physics. Professor at the Federal University of Uberlândia.
0000-0002-6044-4557

Bruno Bernardo de Araújo
PhD in Communication. Professor of the Department of Communication and the Graduate Program in Communication at the Federal University of Mato Grosso.
0000-0002-8288-2718

Received on: 03.01.2024
Accepted on: 06.26.2025
Published on: 07.17.2025

ABSTRACT
There are different classifications used to define the new forms of production and distribution of news since the popularization of the internet and its technological advances, such as automation. This manuscript search to retrieve the history of the introduction of automation in journalism, proposing an analysis of the concept presented by different authors. Guided by the Actor-Network Theory (TAR), we identified authors who explicitly relate the concept of automation to a collaborative vision between human and non-human players, distancing themselves from the polarization between technology and journalism. This perspective highlights the associations of players in co-creation, collaborative and distributive with a focus on innovative solutions in journalism.

KEYWORDS: Automation in Journalism; Concept; Actor-Network Theory.

Introduction [1]

According to Berlo's perspective (1999), the communication process is dynamic and is part of a social, historical, cultural and technological process. Based on this definition, the changes and permanence in journalism and the accelerated advancement of new communication technologies in recent decades have substantially changed the old forms of news production and dissemination, which have led to structural changes in journalism. This reshaping of journalism has brought on innovations and has changed the processes and standards of journalism. Given the

[1] This study was supported by the Federal University of Mato Grosso through a 2024 call for proposals for publication in qualified journals, issued by the Office of the Vice President for Research.

e-ISSN nº 2447-4266
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procedural and dynamic nature of communication, these changes have forced us to search for and register the origins and concepts that affect these reshapings and affect us as researchers, scholars, professionals and teachers of journalism.

Christofoletti (2019, p. 44) looks at the dramatic increase of information channels and decrease in news value, and compares it to the growing trend of online journalism as an open, decentralized, "dynamic and fluid" system that is capable of producing creativity, innovation, collaboration and diversity.

Our approach in this paper is not about creating a fascination or fear of technology, our approach is to trace the history and concept of automated journalism.

Automated journalism is a focus of scientific publications, professionals and the media market concern themselves with it, and it is innovative with regards to how news content is investigated, produced, presented, distributed and circulated. As it currently stands, automated journalism in the second decade of the 21st century is closely connected to the development of journalism since the 1950s. But how did it start? At what point did automation and computational processes begin to be associated with journalism? Which concepts of automation are currently available more than 70 years after their implementation in journalism?

These questions led us to search for the idea, perception, definition, or what we call in science, the concept of automated journalism. It is important to remember that there is no consensus among authors and different areas of knowledge such as Linguistics, Terminology, Library Science and Information Science regarding the "concept of concept", given the different epistemological matrices (Maculan & Lima, 2017). We adopted Maculan's perspective of concept (2015, p. 105), who believes that a concept is composed of a referent, a meaning, and a signifier. It starts with an intellectual and mental conception of a referent, which is an object (concrete or abstract) in a given domain of use. According to Maculan (2015), the properties, characteristics, and attributes of this referent, as well as its relationships with other referents, are externalized and translated into its meaning.

Using this concept as a basis, we present the notions, properties, characteristics and attributes of automated journalism as posited by different authors who, over time, have made great efforts toward better understanding automated journalism at a time of profound socio-historical changes that involve human and non-human agents.

One seminal Brazilian work that compiles authors and reflections on automated journalism comes from Dalben (2018). Our work is based on this author's contribution to the concepts of automated journalism and the main authors she categorized. Our

e-ISSN nº 2447-4266
Palmas, v. 11, n. 1, 2025
http://dx.doi.org/10.20873/uft.2447-4266.2025v11n1a15en

objective is to present the differences and approximations of the concepts and use of the term "automation" in journalism as presented by the most relevant authors listed in Dalben's work (2018). We also present new authors and their respective views on the phenomenon in light of the Actor-Network Theory (ANT) as developed by anthropologist and philosopher of science Bruno Latour (2005).

Searching the *Google Scholar* database and *Crossref* database from the Capes journal portal for the term "automated" and "concept automated journalism" allowed us to identify authors and articles that have attempted to conceptualize the phenomenon over the last few years. Although the databases do contain a large amount of work on the topic, for the purposes of our analysis, we established two criteria to help us select our texts:

1. Consider the definitions posited by the authors mentioned by Dalben (2018); and

2. Consider the main scientific articles on automated journalism in the *Crossref*[2] database (according to the relevance of said articles) and excluding those that did not focus on the concept.

From a theoretical-methodological point of view, we seek the theoretical support of Latour (2005), Zago and Primo (2015), and D'Andrea and Dalben (2017) toward understanding automated journalism based on the Actor-Network Theory and sociotechnical networks. This paper is a result of our effort to historicize automated journalism based on the work of Autor (2022) and the survey of the concepts presented in Dalben's cartography (2018) and the aforementioned databases.

Automated: the complex relationship between humans and non-humans

Starting from a symmetrical and non-anthropocentric point of view, the Actor-Network Theory (Latour, 2005) considers social actions to be the result of a relationship between humans and non-humans, one which involves a collaboration and realization of a complex network in an equally complex news production process – sociotechnical networks (D´Andrea & Dalben, 2017) – that focuses on understanding the different actors involved in complex journalism and complex hybrid networks in relationships that involve human and non-human actors (actants).

[2] There is a large volume of scientific works in these two databases. We took the results from the *Crossref* database when selecting the texts in our analysis.

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Zago and Primo (2015) state that journalism is not restricted to production by "social relations" between editors, journalists and sources, it is also produced by non-human actants (computer networks) that also change journalism through technological devices acting as social actors with transformative powers.

The caveat these two authors make is that journalism theories should consider these devices to be just as important as any other actant in the production, circulation and consumption of news. This is one facet that leads us to attempt to historicize the process of automated journalism, as well as the concepts presented by different authors.

This structure of the Actor-Network Theory (which we can summarize as a geometric figure with nodes - formed by people and algorithms - which is connected by links - the connections between them) has the typical topology of a complex network, a subject that has been studied quite a bit. Networks formed by human actions and connections do not have random behavior; on the contrary, they have a general organizing principle which is shared by radically different systems (Reka & Barabási, 2002).

To move forward, it is important to recognize that technologies are inherent to journalism and not just an accessory, as some authors posit in their analyses when they present a merely instrumental view of digital devices. Journalism is the result of a web of networks and cannot be summarized as a binary vision of opposite poles: journalism *versus* technology. So, why does a network form? The answer is: to obtain knowledge. Whenever a network is developed, a substance is transformed from an object into a thing, from a matter of importance to a matter of interest. So the network concept takes into account the ability to redistribute and reallocate actions.

If journalism makes technology, technologies also make journalism as social media is a product of a relationship. For this reason, the Actor-Network Theory (Latour, 2005) states that an actor is an agent that makes a difference in an ongoing action, it is an element of the network that acquires strength or has its strengths enhanced when associated with other elements. According to Latour (2005), social should be thought of as a trail of associations between heterogeneous elements in which non-humans are "co-creators" of journalism.

In this regard, non-humans are not an attribute or property of human actants. Latour (2005) suggests that all elements have the same weight and act in plain terms, so that the network becomes a series of actions in which each participant is treated as a full mediator. He goes on to say that a network is what is produced in the non-

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anthropocentric relationship between humans and non-humans, and what is generated by associations, what is woven together, presents mobility, and concerns the dynamics of relationships.

Given this perspective, we seek to trace this historical process between technology and journalism, and their corresponding actants in automated journalism. We shall demonstrate the origins of automated journalism in an attempt to weave a "patchwork of recent history" and conceptualize the term "automated" as it pertains to journalism from different matrices and perspectives of this current communication phenomenon.

Pulling on the strings of the story

A search in the *Scopus* database did not present any texts dedicated exclusively to the history of automated journalism in a systematic manner. Ferreira et al. (2022) attempted to trace and basically organize the history of the phenomenon. According to that study, using the *Scopus* database to search the term "history of automated journalism" and *Google Scholar* the term "history of automated journalism" revealed that, at least in these databases, there is a lack of texts on the historicity of automated journalism. The authors found fragments of the history in different texts and then "put the pieces of the puzzle together" for Portuguese-speaking audiences, as most references are published in the English language. The authors documented this procedure and is summarized in Figure 1.

Figure 1
History of Automated Journalism

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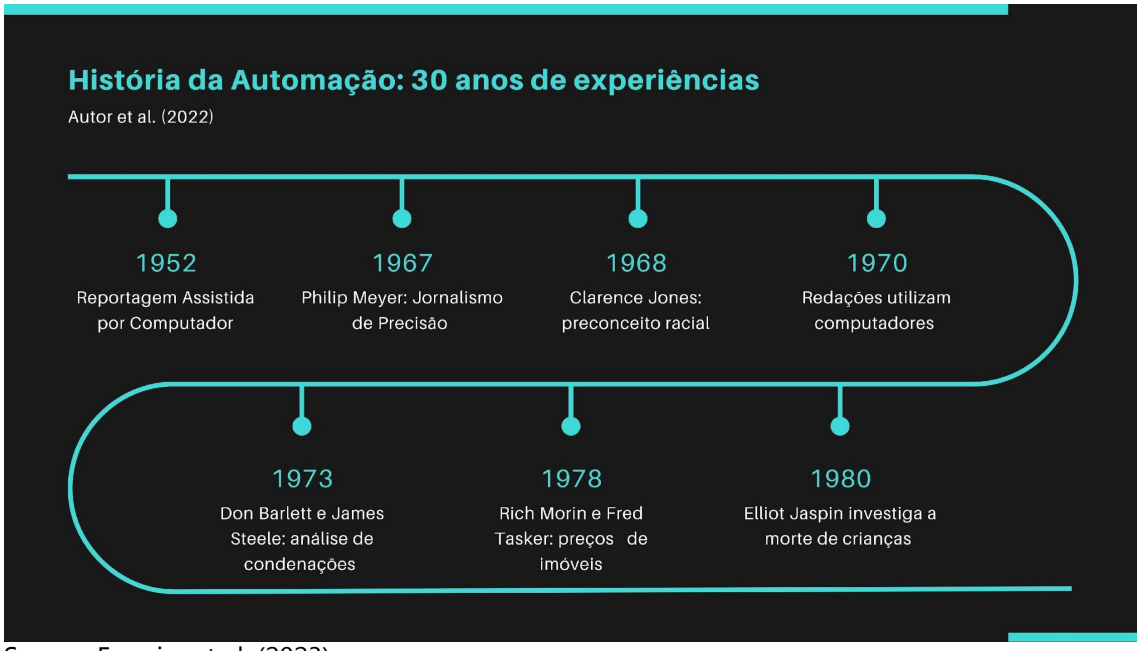

Source: Ferreira et al. (2023).

The American network CBS News first started experimenting with Computer Aided Reporting (CAR) in 1952 when it predicted Dwight Eisenhower's landslide victory in the American presidential elections. The predictions were made on a Remington Rand UNIVAC (Universal Access) computer and were monitored by Walter Cronkite, the network's Washington correspondent.

Following an investigative report in 1967 from the *Detroit Free Press* newspaper analyzing the demographics of African-American people in Detroit after the 1967 riot, Philip Meyer published his book Precision Journalism in 1973, a work that contributed to a *Pulitzer Prize for General Local Reporting* in 1968. According to Lima Junior (2011), it was this work that earned Meyer the title of guru of the computational movement in journalism.

In 1968, Clarence Jones of *The Miami Herald* hired law students to enter legal records into a computer to analyze racial bias in Miami-Dade County. This analysis resulted in the work *A Scientific Look at Dade Crime*, which pointed out discrepancies between the numbers and rates of crimes reported in the city and the violent crime arrests in different police stations, becoming the first journalistic work to analyze government data using computers. In the 1970s, newspapers started to use computers to produce information (Cox, 2000).

In 1973, a series of reports analyzing the legal system called *Unequal Justice* was published by the *Philadelphia Inquirer*, authored by Don Barlett and James Steele, with contributions from Philip Meyer. Also in 1973, David Burnham of the *New York*

e-ISSN nº 2447-4266
Palmas, v. 11, n. 1, 2025
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Times attempted to uncover the relationship between fear of crime and the fear of middle- and upper-class white residents of being victims of crimes committed by African-Americans. In 1978, Rich Morin and Fred Tasker, from *The Miami Herald*, used computerized databases to write a story about unfair property prices in Miami.

Computers became common in newsrooms in the 1980s, and journalists were already using them to store content, references, specific databases, and to analyze government records in investigative reports, such as the one by Elliot Jaspin, from *The Providence (RI) Journal*, which investigated the deaths of children in school-bus related accidents. Jaspin discovered links between offences, bus drivers and drug trafficking, which led the state to overhaul its hiring process for school bus drivers. Another report made use of databases and computers to analyze the records of 35,000 mortgages that were supposed to help low- and moderate-income buyers. This report revealed that most of the people who received these mortgages were the sons and daughters of high-ranking state officials and resulted in 25 charges. In 1990, CARs were already prevalent and used spreadsheets, database management systems and online resources. As early as 1997, newsrooms were using searchable databases on the internet.

Precision Journalism (Meyer, 1991) was driven by CARs and developed further through the use of computers and automation. Many authors attributed different names to this type of journalism: Computational Journalism (Anderson, 2012), Machine Journalism (Van Dalen, 2012), Robot Journalism (Carlson, 2014), Algorithmic Journalism (Dörr, 2015), Automated Journalism (Graefe, 2016) and Data-Driven Journalism (Barbosa, 2007). Dalben (2018) categorizes these monikers and claims that, since the 1950s and 1960s, *Natural Language Generation* (NLG), a field of Computer Science, has been conducting translation experiments and creating small sentences with simple grammatical structures. These systems have become more complex since the 1970s when software for writing texts was introduced, initiating the first journalistic application of this type of technology, highlighting the associations between humans and non-humans in news production.

The automation input: conceptual searches

We propose to present the concepts of automated journalism from the main authors listed by Dalben (2018), looking at the differences and approximations of the concepts presented by the most relevant authors in relation to the use of the term "automation" in journalism, and present new authors and their respective views on the phenomenon. To do this, we searched the *Google Scholar* database and the *Crossref*

e-ISSN nº 2447-4266
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database from the Capes journal portal for the term "automation" or the corresponding term in Portuguese "automated" and "concept automated journalism". The criteria we used for selecting and analyzing the texts were: 1) consider the definitions posited by the authors mentioned by Dalben (2018) and 2) consider the main scientific articles on automated journalism in the *Crossref* database (according to the relevance of said articles) and excluding those that did not focus on the concept which is our object of analysis. Table 1 lists the authors categorized by Dalben (2018).

Table 1

Dalben categorization (2018)

Author(s)	Year	Title	Concept
Christopher W. Anderson	2012	Towards a sociology of computational and algorithmic journalism	Computational Journalism
Arjen Van Dalen	2012	The Algorithms behind the headlines	Machine Journalism
Matt Carlson	2014	The Robotic Reporter Automated journalism and the redefinition of labor, compositional forms, and journalistic authority	Robot Journalism
Nicholas Konstantin Dörr	2015	Mapping the field of Algorithmic Journalism.	Algorithmic Journalism
Andreas Graefe	2016	Guide to Automated Journalism	Automated Journalism
Suzana Barbosa	2007	Jornalismo Digital em Base de Dados (JDBD) – um paradigma para produtos jornalísticos digitais dinâmicos	Data-Driven Journalism

Source: Ferreira et al. (2023).

Anderson (2012) uses the term *Computational Journalism*[3] and relates it to the increasingly ubiquitous conditions of algorithmic, scientific, social and mathematical forms of journalism adopted by many 21st century newsrooms and promoted by several educational institutions as "the future of news". By definition, *Computational*

[3] Anderson makes it clear that this term is how "academics" refer to these journalistic practices. Therefore, it is not a term that he coined, but one borrowed from someone else. Anderson (2012) also clarifies his sociological stance with regards to discussing the phenomenon, avoiding proximity and maintaining the necessary and skeptical distance regarding current developments.

e-ISSN nº 2447-4266
Palmas, v. 11, n. 1, 2025
http://dx.doi.org/10.20873/uft.2447-4266.2025v11n1a15en

Journalism is "the combination of algorithms, data and knowledge from social sciences to complement the responsible function of journalism" (Turner & Hamilton, 2009, p. 4).

> Ultimately, interactions among journalists, software developers, computer scientists and other scholars over the next few years will have to answer that question. For now though, we define computational journalism as the combination of algorithms, data, and knowledge from the social sciences to supplement the accountability function of journalism. In some ways computational journalism builds on two familiar approaches, computer-assisted reporting (CAR) and the use of social science tools in journalism championed by Phil Meyer in Precision Journalism: A Reporter's Introduction to Social Science Methods (Rowman and Littlefield, 2002). Like these models, computational journalism aims to enable reporters to explore increasingly large amounts of structured and unstructured information as they search for stories (Turner & Hamilton, 2009, p. 4).

Anderson (2012) takes up the ideas of the two authors to emphasize the change to the journalism landscape as a result of ubiquitous computing: undermining traditional business models, rebalancing the relative power of reporters and the public, and accelerating the delivery of information. The caveat Anderson makes is that *Computational Journalism* cannot change the commercial position of contemporary journalism, but it can create new tools and take better advantage of this new information environment by providing sustainability to journalism's investigative work during current technological changes. Anderson (2012) states that studies on *Computational Journalism* emerged from the connection between journalism and computer science. In fact, according to what we mentioned previously, computing has always had a close relationship with journalism, which reaffirms the perspective of the Actor-Network Theory of symmetry, collaboration and horizontality between actors, rejecting the vision of polarization between areas of knowledge and transforming agents.

e-ISSN nº 2447-4266
Palmas, v. 11, n. 1, 2025
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Another concept in Dalben's categorization (2018) is *Machine Journalism* (Van Dalen, 2012), which refers to journalistic content produced by machines and thus being automated. According to Van Dalen (2012), automated journalism has entered a new phase where algorithms automatically generate news based on statistical information and a set of phrases, there is no interference from human journalists and so the term used is robot journalists. According to Van Dalen and based on a survey conducted with journalists, once routine tasks can be automated, journalists will have more time for in-depth reporting.

Matt Carlson (2014) uses the term *Robot Journalism* for journalism produced by a Robot or Robotic Reporter. When presenting his point of view, Carlson (2014) points to automated journalism as one of the most disruptive emerging practices in data-centric journalism, considering algorithmic processes that convert data into narrative news texts with little or no human intervention, only that which precedes production, in this case, programming.

Another perspective comes from Dörr (2015) who suggests that *Algorithmic Journalism* represents the most recent and most disturbing model for communication and democracy, having a large potential to expand the capacity of journalism and make democratic institutions more responsive and readable to the public.

Similar to Carlson (2014), Graefe (2016) defines *Automated Journalism* as the process that uses algorithms to automatically generate news from data without human intervention, except in the programming phase. Once the algorithm has been developed, each stage of the news production process can then be automated, namely: collecting data, analyzing data, writing and publishing news, operating in situations where clean, structured and reliable data is available in a database. Automation can create content and customize it to the needs of the individual reader and do so much faster and cheaper than human journalists could.

Based on authors from communication, journalism and computer science, Barbosa (2007) conceptualizes *Data-Driven Journalism* (DDJ) as the model that is structured and organized on databases, in addition to presenting news content using specific functionalities and categories which allow for the creation, maintenance, updating, availability and circulation of dynamic digital news products. For Barbosa (2007), DDJ is a transitional paradigm between the third and fourth generations of digital journalism.

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Palmas, v. 11, n. 1, 2025
http://dx.doi.org/10.20873/uft.2447-4266.2025v11n1a15en

Table 2

Database organization

Author(s)	Year	Title	Concept
Carl-Gustav Linden	2018	Algoritmos para Jornalismo: o futuro da produção de notícias	Computational Journalism
Waleed Ali and Mohamed Hassoun	2019	Artificial Intelligence and Automated Journalism: Contemporary Challenges and New Opportunities	Data Journalism Algorithmic Journalism Automated Journalism Metrics-Driven Journalism
Jonathan Peters	2021	How libel law Applies to Automated Journalism	Automated Journalism
Anja Wölker and Thomas Powell	2021	Algorithms in the newsroom? News readers' perceived credibility and selection of automated journalism	Automated Journalism
Sina Thäsler-Kordonouri and Kurt Barling	2023	Automated Journalism in UK Local Newsrooms: Attitudes, Integration, Impact	Automated Journalism

Source: Ferreira et al. (2023).

Linden (2018) is another author who we identified through our searches and reading about the concept of *Computational Journalism* and who we consider "more appropriate and aggregating". When citing Young and Hermida (2014), Linden (2018) refers to the combination of algorithms, social sciences, mathematical processes and systems for news production. He looks to Hamilton and Turner (2009), cited earlier in this text, and their definition of *Computational Journalism* which is an association of algorithms, data, and knowledge from the social sciences that supplement the journalistic function of commitment to the truth.

Ali and Hassoun (2019) list four concepts: *Data Journalism, Algorithmic Journalism*, *Automated Journalism* and *Metrics-Driven Journalism*. The first concept they present is *Data Journalism* and refers to the process of extracting useful information from data, writing texts based on the information and incorporating visualizations into the texts with a focus on helping the audience read and interpret the story or narrative. *Data Journalism* is a combination of a series of fields: investigative research, statistics, design, programming, and other fields that are significant in themselves.

The second concept is *Algorithmic Journalism,* which is defined as the innovative process that occurs between journalism and data technology, and can

e-ISSN nº 2447-4266
Palmas, v. 11, n. 1, 2025
http://dx.doi.org/10.20873/uft.2447-4266.2025v11n1a15en

include a combination of algorithms, data, and knowledge from the social sciences to supplement the *accountability* function of journalism.

The third concept is *Automated Journalism*, which refers to the growing amount of content produced automatically through technologies developed by providers of automated content solutions, that is, algorithmic processes that convert data into narrative news texts with little or no human intervention in the programming phase.

The fourth concept is *Metrics-Driven Journalism*, which refers to the countless attempts to make sense of an ever-increasing amount of the public's digital footprints with the potential to influence decision-making processes at all stages of the news production process.

Peters (2021) is yet another author who defines *Automated Journalism* as the use of algorithms to translate data into narrative news content, thus increasing the media's efficiency in expanding reports to a variety of subjects, from economics to sports. Despite the positive direction of automated journalism, Peters (2021) recognizes that algorithms are not good at interpreting or contextualizing complex information and, therefore, are subject to biases and errors and can produce uninformative, misleading, or false content.

Wölker and Powell (2021) define *Automated Journalism* as the autonomous production of news content by computer algorithms, which has become an increasingly prominent practice in newsrooms, allowing for the production of multiple articles, quickly and cheaply.

For Thäsler-Kordonouri and Barling (2023), *Automated Journalism* is a human-computer collaboration in newsrooms, one where algorithms are used to convert numerical data, images, or text into written, audiovisual news with various levels of human interpretation, in addition to initial programming. This is accomplished with the use of natural language generation (NLG) models that automatically produce human (natural) language from a representation or computational code.

Final Considerations

One cannot deny that journalism is going through a historic transition with changes occurring to the organizational structures, functions, and roles of media companies, business models, and sustainability. This is the result of rapid advances in digital technology that have consolidated the most important revolution within the profession in the digital age, and reshaped newsrooms based on artificial intelligence algorithms. Also undeniable is the potential these technologies have to improve

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Palmas, v. 11, n. 1, 2025
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journalism by processing a large volume of data in a short period of time, thus providing more diverse coverage.

In light of our initial concerns, we present a historical review of automated journalism and identify authors who present the concept of automated journalism based on approaches and distances from a perception of the phenomenon more or less focused on technology, technological artifacts, innovations such as algorithms, machine learning, and natural language, with a bias towards computation and a focus on non-human agents. However, we also identified perspectives and attempts to define automated journalism that are more in line with the Actor-Network Theory (Latour, 2005), which considers a symmetry of human and non-human actants that does not value one agent more than another.

This systemic and organic vision of a network of associations and collaborations is contained in concepts from Anderson (2012), Linden (2018), and is presented in a more expanded and somewhat explicit form in Thäsler-Kordonouri and Barling (2023), who define *Automated Journalism* as a *human-computer collaboration* in newsrooms. What Thäsler-Kordonouri and Barling (2023) present (which is relatively relevant) in their most recent publication we found in our database search is a vision that is very much in line with the Actor-Network Theory; a symmetrical relationship between the actants, one that is neither anthropocentric nor technocentric, but is collaborative, associative and redistributive, and focuses on building innovative solutions that contribute to the participation of full social actors with transformative roles.

Carlson (2014) and Graefe (2016) present the concept of automation in journalism through the terms *Robot Journalism* and *Automated Journalism*, respectively. Both present a segmented view of actants and recognize human participation in an episodic way in the programming phase, in other words, at the beginning of the communication process. This perception places the actors involved as unequal and, to a certain extent, projects a tone of partiality in only one phase or fraction of the process.

Although we presented the concept of automation based on 11 published works, the most relevant issues for our analysis were contained in six of them (Anderson, 2012; Linden, 2018; Thäsler-Kordonouri & Barling, 2023; Carlson, 2014; Graefe, 2016). Our work suggests a need for further studies on the history and conceptualization of automated journalism, remembering that, in the past, automation became a mainstay for various forms of journalism, but today it is present in all journalism routines, the impacts of which continue to reshape journalism, the

distribution and circulation processes, the business model, as well as the way it is consumed and the way audiences participate in it.

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e-ISSN nº 2447-4266
Palmas, v. 11, n. 1, 2025
http://dx.doi.org/10.20873/uft.2447-4266.2025v11n1a15en

RESUMO
Existem diferentes nomenclaturas utilizadas para definir as novas formas de produção e distribuição de notícias a partir da popularização da internet e seus avanços tecnológicos, como a automação. Este trabalho busca resgatar a história da introdução de tecnologias de automação no jornalismo, propondo uma análise sobre o conceito apresentado por diferentes autores. À luz da Teoria Ator-Rede (TAR), identificamos autores que relacionam, explicitamente, o conceito de automação a uma visão colaborativa entre actantes humanos e não-humanos, distanciando-se da polarização entre tecnologia e jornalismo. Essa perspectiva evidencia as associações dos actantes em co-criação, colaborativa e redistributiva com foco em soluções inovadoras no jornalismo.

PALAVRAS-CHAVE: Automação no Jornalismo; Conceito; Teoria Ator-Rede.

RESUMEN
Existen diferentes nomenclaturas utilizadas para definir las nuevas formas de producción y distribución de noticias a partir de la popularización de internet y sus avances tecnológicos, como la automatización. Este trabajo busca rescatar la historia de la introducción de las tecnologías de automatización en el periodismo, proponiendo un análisis del concepto presentado por diferentes autores. A la luz de la Teoría del Actor-Red (ART), identificamos autores que relacionan explícitamente el concepto de automatización con una visión colaborativa entre actores humanos y no humanos, distanciándose de la polarización entre tecnología y periodismo. Esta perspectiva pone de relieve las asociaciones de los actores en la co-creación, la colaboración y la redistribución con un enfoque en soluciones innovadoras en el periodismo.

PALABRAS CLAVE: Automatización en el Periodismo; Concepto; Teoría del Actor-Red.