

CONNECT-THE-DOTS: ARTIFICIAL INTELLIGENCE AND AUTOMATION IN INVESTIGATIVE JOURNALISM

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DOCTORAL PROGRAM IN DIGITAL MEDIA

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“To those who can hear me, I say - do not despair. The misery that is now upon us is but the passing of greed - the bitterness of men who fear the way of human progress. The hate of men will pass, and dictators die, and the power they took from the people will return to the people. And so long as men die, liberty will never perish.

Soldiers! Don't give yourselves to brutes - men who despise you - enslave you - who regiment your lives - tell you what to do - what to think and what to feel! Who drill you - diet you - treat you like cattle, use you as cannon fodder. Don't give yourselves to these unnatural men - machine men with machine minds and machine hearts!

You are not machines! You are not cattle! You are men! You have the love of humanity in your hearts! You don't hate! Only the unloved hate - the unloved and the unnatural!

Soldiers! Don't fight for slavery! Fight for liberty!

In the 17th Chapter of St. Luke, it is written: "the Kingdom of God is within man" - not one man nor a group of men, but in all men! In you! You, the people have the power - the power to create machines. The power to create happiness! You, the people, have the power to make this life free and beautiful, to make this life a wonderful adventure. Then - in the name of democracy - let us use that power - let us all unite.

Let us fight for a new world - a decent world that will give men a chance to work - that will give youth a future and old age a security. By the promise of these things, brutes have risen to power. But they lie! They do not fulfil that promise. They never will! Dictators free themselves but they enslave the people! Now let us fight to fulfil that promise! Let us fight to free the world - to do away with national barriers - to do away with greed, with hate and intolerance. Let us fight for a world of reason, a world where science and progress will lead to all men's happiness.

Soldiers! In the name of democracy, let us all unite!”

- Charlie Chaplin, final speech from “The Great Dictator”

“If our computers and phones understood a little about the limits of human attention and memory, they would be much smarter and more educated”.

- Eric Horvitz, Microsoft Research

Resumo_

Depois da epidemia COVID-19 e das consequentes crises humanitárias que assolaram o planeta, surge uma necessidade de reivindicar o papel do jornalismo de investigação como *watchdog* e sistema de permeação da justiça social e democracia pela exposição pública. Assistimos a um decréscimo acentuado do investimento desta especialidade do jornalismo, seja pela sua impertinência no tratamento de questões de gestão pública, seja pelo tempo gasto neste tipo de investigações que demoram, fundamentalmente, mais tempo que o jornalismo de atualidade para obter resultados. Neste sentido, percebemos a influência da automação e da inteligência artificial nos processos de produção informativa para dar destaque a todas as tarefas humanas, com a possibilidade de serem realizadas em menos tempo por sistemas tecnológicos. Tendo em consideração esta possibilidade, surgiu o interesse de estudar, em profundidade, como é que a automação e a aplicação de inteligência artificial através de plataformas de apoio ao procedimento habitual do jornalismo, pode, de facto, ajudar e, até mesmo, melhorar o estado global da prática de jornalismo de investigação na atualidade. A plataforma *Connect-the-Dots*, e o assistente *DODO* surge como uma hipotética solução digital para algumas das problemáticas que o jornalismo de investigação enfrenta atualmente e poderá ser uma forma de concretizar de forma prática o jornalismo de investigação no seu âmbito de inovação integrando ferramentas e práticas de código aberto numa abordagem de arqueologia do conhecimento fundamentada no método *Design-Based-Research*.

Palavras-Chave:

Inteligência Artificial, Automação, Jornalismo de Investigação, *Design-Based-Research*, Media Digitais.

Abstract_

After the COVID-19 epidemic and the consequent humanitarian crises that devastated the planet, there is a need to claim the role of investigative journalism as a watchdog and permeation system of social justice and democracy through public exposure. We are witnessing a sharp decrease in investment in this journalism specialty, either because of its impertinence in dealing with public management issues or because of the time spent on this type of investigation, which fundamentally takes longer than current journalism to produce results. In this sense, we perceive the influence of automation and artificial intelligence in information production processes to highlight all human tasks with the possibility of being carried out in less time by technological systems. Considering this possibility, there was an interest in studying, in-depth, how robotics and the application of artificial intelligence through platforms that support the usual procedure of journalism can help and even improve the global state of investigative journalism practice, nowadays. The *Connect-the-Dots* platform and the *DODO* assistant emerge as a hypothetical digital solution for some of the problems that investigative journalism currently faces. It could be a way to practically implement investigative journalism in its scope of innovation by integrating tools and open-source practices in a Design-Based-Research approach to knowledge archaeology.

Keywords:

Artificial Intelligence, Automation, Investigative Journalism, Design-Based-Research, Digital Media.

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Contributions_

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Introduction

Introduction_

The *Connect-the-Dots* project is an investigation based on the idea of developing a practical solution to problems that state of investigative journalism currently faces. We initially identified these problems when we analyzed the state of art of applications and support platforms for this specific of journalism. We found that automation and artificial intelligence have been a way of addressing these problems, especially in current affairs journalism. For this type of journalism, we identified work developed areas like machine learning, algorithm training, identifying sentiment in writing and automation that can reduce the amount of text to be analyzed. However, we did not find solutions that would help reduce the time spent analyzing data related to research or tools that were geared towards supporting critical thinking and generating graphic content to support reading and analyzing documents. For this reason, we believe it is pertinent to follow a line of investigation that takes into consideration these fundamental attributes of investigative journalism.

The reason that led us to investigate this subject was due to the need to highlight the potential of investigative journalism and support its production by reducing the technological workload for the journalist. However, during the investigation, we adapted the study and the prototype idea to the events that were emerging, and which were directly influenced by investigative journalism. The first major event that largely influenced the prototype draft was the COVID-19 epidemic, and the emergence of problems associated with mental exhaustion in journalism. Due to this need, we developed solutions that would help journalists achieve maximum cognitive efficiency, thus respecting their physical and mental health.

Another event that was preponderant for the development of the idea presented in this thesis was the outbreak of the humanitarian crisis between Russia and Ukraine. From this conflict we also identified some needs that we had not foreseen, namely the need for technological support for journalists in combat zones. Given this need, we tried to outline some solutions that could help investigative journalists in war situations.

Allied to these disruptive events of social cohesion, with this project we wanted to reinforce the idea of journalism as a watchdog and fourth power, creating tools that can reduce the workload and time invested by the journalist in investigations so that in this way there can be greater funding. by media groups in this type of journalism, so that it can, in fact, fulfill its function as counter-power. So, in this way, we try to understand through the study of what has already been done, and the projection of what can be added to the current state of automation in journalism and understand how artificial intelligence can improve the global state of investigative journalism.

We aim to understand how the combination of investigative journalism with artificial intelligence can be prevalent in solving the problems that society presents today, namely leveraging the investigative journalism production that has low levels of funding compared to other journalism specialties compared to other specialized journalism subjects. This purposed will be carried out by trying to find answers to the main research question and in what way it can bring new light on journalistic working flow, stressing out matters as trust in news production and sources information related, and consider new ethical challenges.

Therefore, having identified the problem, we defined that our research goals would involve understanding what kind of technological solutions currently exist and what we can learn from the development of these tools. In this way, we believe that the archeology of knowledge can be predominant in our study, making a retrospective of what has already been

created and identifying what can be improved. We also set the goal of understanding the history and socio-cultural context of both current affairs journalism and investigative journalism and also, to understand how automation and computing have evolved in the context of journalism and especially how artificial intelligence has changed the history of investigative journalism. Understanding and contrasting historical facts serves to understand how we can reframe the problem and how we can deal with it, considering advances and setbacks from a scientific point of view.

Based on this understanding of historical facts and the evolution of investigative journalism and artificial intelligence, we consider it crucial to validate the hypotheses regarding the use of artificial intelligence and automation of journalism, carrying out field research in order to understand real needs. To this end, we carried out an on-site investigation at the portuguese public television station - RTP - in order to evaluate, through participatory observation, the needs that today's journalists feel and that can be suppressed by automation and artificial intelligence. This experience also made it possible, for us, to achieve another goal, namely identifying the journalist's workflow, and then using this same workflow as the basis for applying the tools we outlined for this project.

Therefore, given this need for research and technological relevance for innovation in investigative journalism, as identified before, the starting question that conceptually supported the entire study that was developed: to what extent can a semi-automated tool leverage the results of investigative journalism? In addition to this question, which covers a large part of the scientific development carried out, in this project, more specific questions emerged, which allowed us to narrow the study perspective. So, we tried to understand, to what extent data visualization/data journalism can be applied as tools to help investigative journalists, to what

extent an algorithm can help journalists increase cognitive efficiency and how artificial intelligence can help with the critical thinking process in investigations linked to journalism.

Given these starting points regarding the academic debate on these issues, we tried to outline a hypothetical digital solution that would respond to the needs conveyed in these questions, based on the integration of open-source tools and the practice of knowledge archeology, to implement investigative journalism in the spotlight of technological innovation.

Throughout this thesis we develop the *Connect-the-Dots (CTD)* research project, a platform that supports investigative journalists, and we also present the critical debate on the integration of automation and artificial intelligence in the journalist's workflow. Throughout this thesis, it will be possible to understand the theoretical foundation that supports our hypotheses, how we include participatory observation, and the application of surveys and interviews to design the structure of CTD prototype concept and *DODO* assistant.

In the first chapter, we approach the main historical and investigative phases of journalism, comparing the two ideas. In chapter two, we talk about the concepts of automation and artificial intelligence and how computational journalism underpins digital tools and which platforms resemble the *CTD* project. In chapter three we introduce our methodological basis for the development of research, and we deepen to what extent *Design-Based-Research* is the most relevant methodology to achieve scientific goals in this context.

In chapter four, we explain our research *in loco*, showing how the ethnographic experience and the participatory observation carried out in the newsrooms of the CPN of RTP was processed. In chapter five, we analyze the surveys and interviews carried out during the ethnographic experiment, measuring the relationship between the results of data collected and assessing how they influenced the prototype concept design and the implications for theory. In chapter six, we introduce, in an explanatory way, the structure of the *Connect-the-Dots*

prototype concept and the tools that will be included in the platform, as well as the characteristics inherent to the *DODO* assistant.

In chapter seven we present the main results of the entire investigation from a scientific point of view, regarding all the possibilities created with this research project, and we also point out the main difficulties and limitations encountered in the process, which may be suppressed with the structural advances in the future.

PART I

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Theoretical Framework

Chapter 1. Journalism and Investigative Journalism

Chapter 1. Journalism and Investigative Journalism

1.1. Structural foundations of journalism

Journalism has a profound relationship with reality, and this could be measured by the way a story is told by the media. This altogether means that journalists have a strong power constructing a perception of reality that is sometimes quite distant from the reality perceived from a closer point of view. This is particularly interesting when we consider talking about the production of news by a robot or a computer system.

When we talk about the production of news made by a human being, we can consider numerous factors that are preponderant to attest the value and quality of the news. These factors are, as said before, matrix values that help to decipher whether information is reality or fiction. If we consider the value of journalism for its historical mark and its development since it emerged as a profession, we realize that its role transgresses its function in many aspects. This progression in the way journalism is produced, and consumed today, is perhaps the best way to understand how it takes effect, how it is considered, and how it reaches the public while maintaining its value as credible and attested information.

Regarding this notion of the role of journalism in society, for this investigation it is necessary to study journalism in a structural way to understand how its workflow can be effectively reproduced.

Regarding the timeline, it should also be noted that the time periods of investigation are notably different from what we believe to be modern-day journalism. It is therefore crucial to emphasize that understanding the purpose of journalism as a profession helps to understand its real need in the present scenario. In this case, what justifies the existence of investigative

journalism is a little different from what sustains regular journalism, as will be discussed later. But at this point we can already talk about the basic needs of both current journalism and investigative journalism. If we think about it, when an investigative journalist must analyze and interpret data from a specific period of time, he must also consider the grounding and surrounding aspects of the event.

The way news is produced is deeply rooted in its applicability in society and in its value as an informative message, this can also be translated into the notion that journalistic work is highly conditioned, but it also recognizes that journalism has a relative autonomy and that journalists are active participants in the definition and construction of news and, consequently, in the construction of reality.

Another aspect that is linked with the structural foundations of journalism is the natural search for truth and freedom. This constant exercise to try to understand the reality and, with that, bring a kind of freedom to information is often mirrored in the idea that reporters must know what questions to ask the source, what "facts" to find. Without having some idea of what the heart of the matter might be, the story to be told, each occurrence could maintain its claim to idiosyncratic treatment and thus increase the variability of occurrences as the raw material of news.

Freedom is so significant in a journalism career that it is sometimes the counterpower for politics and court decisions. The notion of public opinion is closely linked with the concept of government and power. That is why there is a juxtaposition of forces, which has grown over the years, in which journalism can directly confront the orders of power of a given regency. This major role of journalism, and especially investigative journalism, as a hero who is able to restore justice and social equity, questioning autocratic standards, helps to understand how it

is possible to help, through automation, this incessant search for truth and justice, maintaining methodological and deontological accuracy in the production of information, news or reports.

To develop software that will be suitable for investigative journalists we also have to understand the double role of journalists as professionals capable of having a voice in the public sphere, likewise as watchdog to the political power.

Artificial intelligence in investigative journalism can only be understood considering the history and evolution of journalism. And here we also must understand when artificial intelligence started to be predominant within the exercise of functions inherent to journalism.

The press, as we generally know, is linked to its mass production and distribution of copies of sheets that later began to be called newspapers. Information at the level of journalism also progresses with the evolution of the distribution of newspapers. What would be at first a pile of texts on long sheets, was later replaced by images that themselves contained a message to convey, which first appeared to be black and white and then began to be printed in color. This change in the display of news evolved according to technological developments and the consumer's own profile. In addition to these more plastic characteristics of the dissemination of messages, it is also important to emphasize the content of these news - they started out as just expository ones and later evolved into critical ways of looking at society.

Understanding how journalism came about and what its purpose is in society says a lot about the role of social communication in the daily lives of people who need it. Much of the recipe behind journalism is intrinsically public opinion as an instrument of social control. In other words, everything that can build the social notion of world events can be preponderant for the construction of journalistic information, that is, if public opinion is based on a belief about some subject, it is natural that journalistic production is based, for a good period of time, on the subject that most interests the population.

When we talk about journalism, we must consider its importance for the regiment of societies and nations. The power to communicate in various parts of the world is happening with this same need for information, for framing, for a series of events that unfold almost as if it were a soap opera. The reporter/journalist then highlights the role of a communicator, a messenger who will collect information that is of most interest to the population and share it to order to readjust daily events in the media. For our *Connect-the-Dots* project, there is a reinforcement of this idea of news values, when we propose to outline a formula for the journalist's usual procedure. That is, for the design of the prototype idea, it is up to us to praise the usual procedure of a journalist, as well as question its adaptability to investigative journalism and digital platforms. It seems to us that the values of news, and what information represents, have been profoundly transformed by digital and technological developments. The news values that are most interesting to the public undergo changes with the ramification of communication channels with the advent of digital. Strictly speaking, the «inverted pyramid», emphasizing the opening paragraph, the lead starts to undergo profound changes in the way the digital user sees the information. direction and a summary of what the news will be about, on mobile devices and computers, the most important information is the text, and the news ends in its own lead. This means that many users only read the first paragraph, the one in more prominence, so the information introduced in a lead for digital diffusion undergoes deep changes in relation to the lead created for lighter formats. The digital introduced an illogical need to reduce the content for the maximum informative return, so that it can, in a few seconds, be exchanged for a newer, more attractive one, with more views.

Regarding the change in narratives, in the digital realm, Tuchman (1978) and Gans (1979) explore these concepts throughout the evolution of journalism in history and Tuchman reiterates the journalist's versatile and adaptive capacity in the face of different technological

changes over time. It is no accident that investigative journalism became even more fundamental with the advent of World War II.

The role of absolute freedom of the press is a substantial change in the way journalism is perceived as structure of power and press freedom also leads us to realize that information projects in digital, sometimes, also overlap this press freedom, leaving only content that increases economical value and less return to restore press freedom on investigative journalism digital platforms. And we are not talking here about placing individual values of the journalist profession but attesting to the practical tools to produce journalism independently of the regulatory systems of information diffusion.

Investigative journalism and the concept of the fourth power are currently inseparable because reporters have followed a path of public interest in uncovering cases that have incited even more interest than the daily update of facts and events. Investigative journalism came to face bodies of power that were corrupted and this possibility of doing justice, bringing the truth, and unraveling mysteries is what beautifies and central in investigative journalism. We speak mainly of this information isolation when we also refer to the spatial and temporal structure of media and companies that own the media as is the case with the spatial news net, the structuring of time influences the assessment of occurrences as news events. This means, in good assessment, that the structures behind digital information can directly interfere with this notion of freedom of the press.

Regarding investigative journalism, realizing that this area of journalism is relatively recent and that it serves as a tool of counterpower, emphasizes the role of offering opportunities in the digital realm, to process journalistic investigations in a more fluid and less complex way, in terms of the investigation itself and the methods and resources formally used to do reports.

Chapter 1. Journalism and Investigative Journalism

1.2. Journalism and its social function

We can agree that, with age, the role of journalism seems to us to be increasingly fundamental, as an anchor that makes us realize where we are, how we are, and predict, with some level of acuity, what is about to happen. When we watch the news, we read a news item online, we leaf through a newspaper or a magazine, we transpose and believe that what we are told is real and important. This notion that journalistic production is valid and trustworthy is directly linked to the notion of gatekeeper which refers to the person who decides in a sequence of decisions, was introduced by the social psychologist Kurt Lewin in an article, published in 1947, on household decisions concerning food purchases. This is an interesting idea that information must go through several gates, or so to speak, structural validations of what has newsworthy value against what is not. In our prototype idea, we can consider this notion of gatekeeper in even greater depth, placing ways to attest to this continuous verification of the newsworthiness of information, or of its intrinsic value as an informational block that will be part of an investigation.

The system that regulates the entire complex world of journalism has gained its viability over the centuries and the vestments that regulate what news contains a historical lineage that is impossible to defraud. Often the reliability of a news item or a journalist is directly related to the channel or brand of journalism associated with it. These channels, or information brands that are more prominent in journalism, are also so because they exercise a methodology and rigor in the production of information that is visible to consumers.

A large part of the weight of the value of information, for it to be attested as reliable, is its relationship with the sources of information, where the higher the statues of sources and the greater the scope of their positions, the higher the status of the reporters. The sources and the very management of these sources are the true essence that attests the reliability of the information, so, from a social point of view, when we talk about sources we talk about this correlation between the journalist and his source, which cross with others determines the veracity of a matter.

And it is this golden rule that the product of journalistic work is rigorous and reliable that marks its viability as a profession and as a necessary action to balance the forces of power in society.

This reinforcement of the dominant ideology, both as an influencer of journalistic themes, and the fact that journalistic themes are capable of producing a dominant ideology, reinforces here, once again, the role of press freedom and its function as a regulatory body of freedom and social justice.

In this regard, the need naturally arises to understand to what extent we can contribute to this very commendable role of journalism, through automation and robotics. It seems to us that the workload for the journalist who works as a medium and through the digital medium has been increasing in view of the exponential growth of digital data that is currently observed.

In the same proportion of this growth and data distribution, our project proposes a solution with equal growth potential. In any case, all the tools we propose to incorporate and the institutions we contacted were interested in this combination of interests, so it will only be possible to reinforce the role of investigative journalism as a watchdog and as a reinforcement of the pillar of equity and justice for all.

Chapter 1. Journalism and Investigative Journalism

1.3. Freedom and democracy in the public sphere

The concepts of freedom and democracy are volatile these days, from the moment we feel tied to digital platforms in a daily routine. What our perception of reality was before the advent of smartphones has changed considerably with the emergence of these small gadgets. Democracy cannot be imagined as a system of government without freedom, and the central role of journalism, in democratic theory, is to inform the public without censorship.

It's true that on a 1920×1080 screen anything can happen but reducing and putting all the possibilities of creating and disseminating communication in the palm of our hand proved to be somewhat expansive, but at the same dangerous. The concept of citizen-produced journalism began to emerge with the creation of blogs and online platforms, however, with social networks, a new era of information production began, based on free access to information, democracy and law, from producing information, to a surplus of producers of information, of formulas, of communication, of networks of interest.

Democracy is not only formalized by the organs of power and communication, but also becomes a determining tool for the public. This emphasizes the dichotomy established between democracy and dictatorship. The juxtaposition of possibilities for digital elites and niche audiences, came to highlight its flaws, and the law of the immediate is now in force, of what is most appealing, of what does not take long, of what is fleeting. This trivialization of the creation and dissemination of information has shaped an immensity of data without intrinsic value and users feel tired of superfluous content, but they cannot escape the addictive forms of "slot

machine" those digital platforms incite. In an almost magical way, this reality, reinforced by the isolation in the face of the coronavirus, has highlighted the role of journalism and its symbiotic connection with freedom and democracy. That is why the *Connect-the-Dots* prototype concept can be transformative in this sea of information and technological dump: serial to clean, restore and analyze to contribute to a better production of information, less harmful to the global mental output.

Chapter 1. Journalism and Investigative Journalism

1.4. Regular journalism vs. Investigative journalism

When we see Hollywood movies or series that praise investigations, we always see the role of judicial figures working at the same time as we see the investigative reporter doing the same job, but with fewer resources. We often witness journalistic investigation associated with the criminal investigation of court services where it is intended to solve a case, find a culprit, understand the criminal's mind, or unravel a puzzle. In some way, journalists also have this approach to their investigation, whether in the criminal sphere or in another scientific area.

Hence, in many programs and in the global perception of the public, investigative journalism is equated with criminology. However, everything that investigative journalism encompasses goes far beyond criminal investigations. Despite this, we consider the critical thinking that is behind any investigation, and in our specific case in which we explore the world of semiotics on this platform, we find it relevant to emphasize the role of forensic sciences in investigative journalism. The concept of forensic media can gain great prominence as it addresses typologies of investigation based on the collection of evidence and surveillance in the field.

This notion of smaller units of information capable of being analyzed and processed by information systems can be a positive opening to incorporate the ideas of “fourth power” related to the role of investigative journalism. The smaller the information unit to be evaluated, the more neutral and effective its evaluation will be on the parameters to be defined of what is

good journalism compared to the rest of the information that we can call invalid information, unverified information, and false information.

As far as the *Connect-the-Dots* prototype idea is concerned, this way of analyzing the data can be fruitful in reaching quality conclusions in a short time. The great danger that we foresee in the incorporation of forensic science methodologies in the algorithmic approach is the problem of data interpretation. It will be a huge challenge to "teach" a machine to interpret data and predict conclusions based on formulas without using human intuition. In addition to the most basic units of information about investigative journalism, much of what constitutes an investigative report in essence is the assembly of these small informational units to sketch a hypothetical mental map that explains the investigation. Usually, this result is achieved by the combination of knowledge and the application of strategies linked to intuition, critical thinking, the investigator's gaze, and other human sensors that help to reflect on a given investigation.

This notion that journalistic work has an intuitive and emotional component makes us open several fields of perception of what is then possible to replicate in terms of automation and algorithms. The question remains - how can we automate the process of extrapolation of intuition and feelings in the face of the facts and data that the researcher and journalist oversee? How is it possible to teach a machine how to emotionally engage with the content it is generating? These are questions that may have a practical answer in today's science but that can be explored in more detail with the hypothetical advance of technology in times of conflict.

In any case, it is necessary, first, to analyze how the investigative journalist usually proceeds, and even he, a human being, has his constraints, his weaknesses that can also be an opportunity to exalt tools and algorithms that can address weaknesses that hold humans back. What tools can already detect lies through the mediation of medical parameters, facial

expressions, tics and involuntary gestures, pupil dilation, hydration level, pulse, blood pressure, among others? What possibilities do we have to help investigative journalists go further?

In this specific case, the solution for the integration of a prototype vision on this scale is to have a support team of journalists to digitally support users, that is, through the journalistic solidarity approach and to incorporate critical thinking and psychology through a background of journalists who can work as a structuring basis for this prototype idea.

This could be a hypothetical scenario for strengthening critical thinking components in data analysis and interpretation. One of the basic units of information production will obviously have to be text production, news writing and the most basic journalism production.

To understand how this textual production is processed, it is necessary to consider not only structuring elements such as the inverted pyramid, but also the adaptation of the contents in an intuitive way to what is expected to be shared with consumers.

Another possible solution would be for the platform user to make a final assessment of the contents based on their knowledge and intuition. But this would be a topic to be addressed more precisely in the ethical sense of knowledge production by the semi-automated platform.

Chapter 1. Journalism and Investigative Journalism

1.5. The rise of investigative reporting

The main feature that differentiates current journalism from investigative journalism is the depth of study of the topics the researcher needs to understand. In addition to the eminent complexity that is related to this kind of case studies, this way of looking at everyday issues makes investigative journalism an area “*that discourages corruption and reveals wrongdoing across society*” (Stray, 2019, p. 1).

While contemporary journalism aims to promptly inform an event of public interest – in this sense, it does not give it the depth, often related to the why and how – as in investigative journalism. This makes the importance given to investigative journalism validated only by itself, in the intrinsic value that this type of journalism adds.

The great event of the rise of investigative journalism became profoundly notorious with the advent of the first and second world wars in which the need to investigate all crimes associated with war was felt. And this highlights the primary purpose of this category of journalism that proposes to find answers to a social problem that affects the world population on a large scale. Often, this social problem can be recast in a case of corruption, or abuse of power by a governor, but we can also talk about more sensitive situations such as crime scenarios that imply exhaustive investigations from a forensic perspective. That is why it is not so unusual to think of investigative journalism as an integral part of forensic thinking and investigation, for the assessment of a situation in relation to its informative context. On this subject, we highlight the work of Stephen, who tells us that “*the conclusion that less information is better may be difficult for some forensic scientists to accept, however, due to*

what I will call ‘the criminalist’s paradox’. By considering contextual information, analysts may well become more likely to interpret their evidence correctly – that is, to reach conclusions that correspond to what actually happened” (Stephen, 2011, p. 130).

However, when the other evidence points in the wrong direction, the ability of forensic science to correct matters, to put the investigation back on track, is reduced to the extent the forensic evidence is colored by other investigative facts (Stephen, 2011, p. 132). Investigative journalism is therefore necessary, because it seeks to know in profundity an issue that causes discomfort in the social fabric. Usually, these themes form a pattern of attention or visibility that obtains more viewers, and this pattern is later recognized and receives more attention than other informative themes. *“Investigative reporting is, at its heart, watchdog journalism: It draws attention to social problems and wrongdoing by holding accountable people in power and authority, be they leaders in government, industry/corporations, nonprofit organizations, educational institutions, or elsewhere” (Walth et al., 2019, p. 178).*

Investigative journalism relies on original work in the collection of evidence and on-the-ground reporting (Walth et al., 2019, p. 179), this research method, which focuses in a greater percentage on field research and on the reliable investigation of communication professionals, also attest to its validity as a reference alongside other researchers of the same scope. For instance, when a politician embezzles an amount of public money for his own usage, when a serial killer is not found by the police forces or even when we talk about war crimes without justification.

The investigative journalist has a hypothesis in hand that he needs to confirm or dilute, and, for that, he needs to collect enough evidence to reach an imminent conclusion. For this project it is strictly necessary to recognize the usual workflow of investigative journalism. This workflow can often be similar in different newsrooms and media, so we believe there are many

commonalities that can be replicated through automation and the creation of algorithms. It is therefore necessary to understand that this anachronistic transformation of the way of producing investigative journalism through different methodological approaches is what will outline the future of investigative journalism within these foundations.

“The shifts from single newsroom investigative journalism to collaborations, to the use of multimedia, data and crowdsourcing in storytelling suggest that despite challenging economic conditions that have triggered significant industrial restructures in newsrooms, quality investigative journalism continues in the digital age” (Carson & Farhall, 2018, p. 1909).

Investigative journalism is both normative and economically valuable. Hamilton’s work is salient here because it provides an alternative framework whereby investigative journalism’s role in democratic accountability sits alongside, rather than counter to, a political economy perspective (Carson & Farhall, 2018, p. 1900).

This formula of the journalist's usual procedure is what gives him the dexterity to circulate among the meanders of information and capture in interviews and fieldwork and interpret all the information, to reach a conclusion that goes against the unpublished information that he places as unprecedented content that will surprise the viewer.

Chapter 1. Journalism and Investigative Journalism

1.6. IR and the concept of 4th estate

The notion of in-depth investigation of a subject of public interest is what gives the journalist his role as a fourth power. This function is unequivocally equated with the other powers of society; however, it manages to overlap with other authority structures, insofar as it influences the masses to make known a certain ideal to the detriment of another. Kovach and Rosenstiel (apud Walth et al., 2019, p.178) found in their landmark work, *The Elements of Journalism*, argue that journalism is essential to a democracy: *“the primary purpose of journalism is to provide citizens with the information they need to be free and self-governing”*.

When we talk about other powers, such as political power, governmental power, the power of judicial frames, we are talking about nuclei of power that can substantially change the way of life of societies, because it can jeopardize the regulation of power and even remove high positions of control. *“These matters because watchdog reporting and informing the public are considered part of the normative functions that liberal democratic theorists subscribe to news media in democracies”* (Carson & Farhall, 2018, p. 1900).

This notion analyzed from the point of view of the evolution of journalism has been honored and praised given the empirical results in society and the evolution of communication in the digital age. We must also express here the concept of watchdog – dog that watches – which is imminently waiting for the event to be able to talk about it. This concept manages to diminish the effective power of the investigative journalist to put into practice the news values and the journalist's ethics code to have a sensationalist subject at hand. According to Walth

journalists has a duty as a watchdog to call out as elected leaders and others in authority and to push beyond simply exposing problems: journalists must serve as an independent monitor of power (Walth et al., 2019, p. 178).

“Investigative reporting, in its watchdog role, identifying people in power or systems of authority who have failed to protect civic values, such as public health, public safety and welfare, justice, equal access, the public treasury, and the honesty and integrity of our civic leaders” (Walth et al., 2019, p. 179).

One of the major problems that are associated with this notion of investigative journalism as a hero that is able to restore values in society such as justice and social equity, and that goes against everything and everyone to be able to demarcate this aspect of truth above all other things, it can also, on the other hand, bring other inopportune problems that are capable of disrupting the health and professional balance of these journalists. Recent research suggests that the constant barrage of negative news has negative psychological effects, including increased stress. These negative outcomes do not fit the drive of many investigative reporters to see their work have a positive impact (Walth et al., 2019, p. 179).

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1.7. Paradigmatic cases in investigative journalism

Within this perception of investigative journalism and its role in current society, it is necessary to emphasize some paradigmatic cases that were structuring in the history of information and world politics and that give us a broader angle of what investigative journalism is, in practice and its importance for the course of a nation.

“Investigative stories devote their attention to describing aspects of social problems that have not yet been revealed, and they trace the causes of social problems to hold people in power and authority accountable—in effect, looking at the past and the present” (Walth et al., 2019, p. 186).

Within the range of situations that investigative journalist has at hand, the ones that receive the most attention from the consumer are: *“exposing injury and injustice; revealing information that would otherwise remain hidden; or promoting reforms to correct a wrong. Investigative journalism is not the only means of exposing transgressions, but according to its existence serves as a deterrent to democracies”* (Carson & Farhall, 2018, p. 1900). Considering these most outstanding characteristics of the investigative journalist's work, we can theorize that they are consequently present in the best acknowledged cases of investigative journalism worldwide. We can talk here about the imminence of the Pentagon Papers, Panama Papers,

Wikileaks and more recently, Twitterleaks and the information that mediates the conflict between Russia and Ukraine. These paradigmatic cases must be addressed in light of their need for implementation in the social landscape. Namely its emergence in the digital age and its adaptation to the technological and digital assumptions of information distribution and consumption, where *“computational journalism has the potential to help sustain watchdog reporting because it can “hold leaders accountable, unmask malfeasance, and make visible” critical social trends”* (Broussard, 2015, p. 824). We can therefore say that the information leak of investigation cases via the internet through databases is, in a way, fashionable, and this can be analyzed, for example, in the use of these ideas in American movies and series that have an increasing number of fans.

On this issue, the most well-known cases of information journalism that are based on leaks of information, or the knowledge of documents that would somehow be secret, bring to light the need for public opinion to want to know about specific information, which, in some way, as some kind of effect in the audience. And this includes, in some way, the acknowledgement of civic problems that persist in society and for which there is no effective solution. *“Standing apart, investigative reporting and solutions journalism may seem quite different. Both investigative reporting and journalism solutions begin with a similar premise: A problem of civic consequence exists or persists, and without the heat and the light of news media attention the problem will not be resolved”* (Walth et al., 2019, p. 181).

These examples mentioned are the most eminent mirror of information leaks, of documents that can significantly alter or jeopardize substantial positions of power. And even today, many of the embargoed subjects may constitute news in future times, when it is necessary to use them. *“The study sought to discover how often investigative reporting and solutions journalism techniques currently cross over and share traits of one another. The*

findings confirm the literature that both approaches typically share key characteristics: They identify social problems, and they seek the causes of these problems (Walth et al., 2019, p. 186).

These informational data will be used on a large scale by investigative journalists or by anonymous journalists who are part of investigative reporting groups. These groups of journalists who labor anonymously have a working procedure very similar to what exists in judicial bodies, such as the judicial police, or INTERPOL, which have a group of professionals, with different specialties, who work together, each one in their area of expertise, to reach a solution or a common goal, which is the unraveling of the case in question.

“Criminal investigation is a systematic endeavor which aims to establish whether a crime has occurred (and if so, what type of crime), identify and apprehend a suspect and gather evidence with a view to building a prima facie case against a suspect” (Staines, 2012, p. 605).

When several journalists work on subjects anonymously, the results and impacts on society can be more effective as they do not jeopardize the identity and personal life of this professionals. This is an interesting concept because there are many investigative journalists who, in result of their research work, develop mental illness and other repercussions derived from stress and pressure, as they are carrying out work that endangers their safety and often their life.

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1.8. Investigative journalism in digital era

The main difference between investigative journalism in traditional media and investigative journalism in the digital age stems from the use of computers and automatic systems for analyzing and producing information. Stray believes that if machine intelligence were applied to investigative journalism, it might monitor global feeds for significant news, find socially relevant patterns among diverse data sets, and maybe even write up the resulting stories (Stray, 2019, p. 1). However, contrary to is commonly believed, AI is not currently widely used in investigative journalism, despite its supposed promise (Stray, 2019, p. 1) and this has a lot to do, not only with the restricted access to these technologies, but also the inflexibility found by communication professionals to integrate these processes into the investigative journalism workflow.

“The exact shape of the digital transformation of humanitarian communication and response is yet to be seen, but it has already produced certain expectations and raised bigger societal and political questions” (Chernobrov, 2018, p. 2) many of them with a strong ethnic nature and the appropriation of the work carried out by the machines to later be used, with more or less exemption, in the means of spreading information. On this subject, several questions and philosophical debates arise that have at their core the recognition of the quality of information produced by automatic systems.

“AI methods are now commonly applied to the other areas of news work but are still relatively rare in story production. Conversely, automation is increasingly common in investigative work, but most of this would not be considered AI” (Stray, 2019, p. 3).

Before the advent of the digital age, journalists worked mainly with paper documents, analogue photographs, video on film and audio recording on tape. With the introduction of computers in newsrooms, the journalist's working method significantly changed the workflow patterns. *“In his classic study on newsrooms’ adoption of online technologies, Boczkowski (2004) demonstrates how non-technological organizational and professional factors complicate journalism’s relationship with technology. Journalists react to technological innovation in complex ways, from fear of discontinuity to reinvention”* (Carlson, 2015, p. 417).

In the beginning, they even considered that computers would take away the professional position of journalists and there would be an immediate rejection of information systems. In addition to this notion, the concept of citizen journalism was also born, which, far from automation journalism, also came to reflect in the elite milieu delimited by journalists and their resistance to accepting and assuming information that is not produced by traditional and unequivocal methods. Regarding citizen journalism Wall cited by Chernobrov *“defines citizen journalism as news content produced by non-professionals, while in the context of disaster coverage, citizen journalism is often understood as content produced and posted on social media by eyewitnesses who are on the ground”* (2018, p. 5). Therefore, the effective work of citizen journalism is often decisive in framing a news story on the ground and often essential to experience a series of events in the skin and often this citizen journalism is strongly associated with the use of smartphones and social networks and the publication content on

networks such as *tiktok*, *instagram* and *facebook*, which manage their information distribution through automatic systems and algorithms based on the study of user reactions. “*Several data visualization tools have become popular to use on structured data. Putting census data into a data visualization tool like Tableau, which displays maps and bubble charts and other forms, allows the reporter to see patterns that would otherwise be invisible*” (Broussard, 2015, p. 823).

Over the years and decades, it has been confirmed that the role of computing and the automation of newsrooms has improved and facilitated the processes of producing information, and this is extremely noticeable in formats created for digital – the aesthetics used to inform through screens triggered a readaptation in the way of producing and understanding digital journalism. “Perhaps, the most complex challenge in AI-assisted investigative story production is the technical systematization of the concept of “news” “ (Stray, 2019, p. 13).

As stated by Chernobrov (2018, p. 12) digital transformations have the potential to reshape the dominant discourse about affected communities, create a more empowered image of these communities in media, and have a positive effect on the media and aid agencies' ability to draw public attention to some crises. In this sense, “*digital media technologies that enable the viral spread of disinformation provide a timely reappraisal of existing media theories as they challenge the media’s normative fourth estate functions to provide the public with accurate information*” (Carson & Farhall, 2018, p. 1900).

In the socio-economic context in which we find ourselves and based on the dissemination of information that reaches us through different media, there was a logical need for journalists and newsrooms to adapt to the media landscape that has evolved without precedent. “*Reporters have to either develop their own programming skills (which is difficult) or convince an editor to devote in-house programming expertise to the project (which is also difficult, because the few programmers in newsrooms tend to be overextended). Resource and*

personnel shortages are practical reasons for why big data analysis seldom happens in the newsroom” (Broussard, 2015, p. 823).

News media in democracies are in a state of flux in the digital age. Technologies and the internet have made it faster, cheaper and easier to access, share and produce news from a global point of view. But this comes with economic and social costs. *“Scholars have extensively studied financial impacts on traditional news media owing to a range of cultural, political, and economic factors including technological developments that have led to a significant loss of advertising to online competitors” (Carson & Farhall, 2018, p. 1900).*

With regard, specifically to investigative journalism, namely in the development of the CTD, the tools and platforms to support the ranking and interpretation of data were decisive in reducing time spent analyzing documents, photographs and other data to be used in investigations. *“Having a virtual fountain of story ideas is especially useful for the modern newsroom, where online publishing means that reporters and editors need to “feed the beast” almost constantly. Writing only one story a week is a luxury in today’s marketplace, especially at online publications where writers are urged to publish multiple stories a day and editors may edit 30–40 stories a week” (Broussard, 2015, p. 829).*

Chapter 1. Journalism and Investigative Journalism

1.9. History of digital journalism

The news serves as a frame for the current situation, and in a digital context this change in "frame" takes place exactly in a fraction of a second. Digital journalism gets closer to people, but at the same time it creates a distance by tapping facts of public interest in the same level as facts of personal interest. It is as if contemporary journalism and journalism in the broadest sense struggle daily to be in the spotlight, to be demarcated with more intonation than a puppy's video on *tiktok*. In the same way, today we see this possibility of watching conflicts live on social media platforms, we can see textual information in different formats, visual and sound, which we were not allowed in the time of the Second World War.

Digital time starts to run, lives unfold in swipes and what should be a pause time is just another immensity of LEDs flashing information that seems lighter to us, but that are stealing the real perception of the events. The viewing time of the news can give us more concrete clues about how much time an individual spends reading the news nowadays. These information atoms, including metadata, build our perception of our daily reality. Numerous statistics are made daily in order to link with our progress in our consumer profile, algorithms study our behavior to the second.

The media have not lost their value, but are beginning to dissipate through the various media, formats, and types of digital communication. What came to realize that it has become a deposit of informative vulgarities, will also praise new ways of approaching information and even jobs that focus on how to navigate in this so diverse sea that is called technology.

A large part of the evolution of the journalism profession will involve the integration of "digital volunteers" for this series of information. These digital volunteers are opposed to the effective need to validate information through sources. A need that is not perceived in digital volunteers, because they often lack training in the area.

In the context of our prototype concept, this is of greater significance because we believe that this platform can be used not only by investigative journalists, but all researchers from different areas, who need help to make investigations lighter.

Therefore, we can extrapolate the basic needs of journalists to mandatory formats to create reliable content, as in the case of the need for sources, as well as identify their greatest difficulties and automate tasks.

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1.10. Ethical foundations of digital journalism

The scientific debate that permeates not only the ethical issues regarding robotic production, goes even deeper into the incorporation of this information into valid and reproducible systems of journalism. These journalistic reproducible systems are based on deontological structures that need to be emphasized.

The structuring bases of journalism and its ethical expression must be analyzed in detail when we try to extrapolate journalism to its maximum digital expression, and regarding investigative journalism, understand how its methodology can be standardized and replicated by a system of information. With the new paradigm of news as information, the journalist's role is defined as the observer who reports honestly, and balance what happens carefully not to express personal opinions. When we talk about structured journalism we are also talking about the possibility of ethical feasibility step by step in the production of news through semi-automated platforms and algorithms to support journalistic production. To this end, it is necessary to emphasize the notion of a code of ethics that is followed by most investigative journalists. *"The first localized "code of conduct" for journalists appeared in 1890, and although rudimentary and clear "maxims" were recorded in the late 19th century"*(Traquina, 1993). Incorporating this code of ethics in a non-direct way in the semi-automated system that we want to implement can attest to a higher quality of data produced, and a more impartial and objective interpretation of the data for the researcher.

Since there is an immensity of untracked and validated information on social platforms and networks, the audience's perception of digital news information is increasingly low and fragile, the objectivity of the news then becomes like a strong mark on the audience's perception of valid news. One of the landmarks that can guide the way of analyzing content in the *CTD* is the association of values that demarcate the profession of journalists, trying to permeate the heroic image of the investigative journalist or at least the alignment of the values of a character of this type.

What we propose with this prototype concept and with this investigation is also the creation of a stamp/seal that demarcates the guarantee of news quality. This stamp would be based on the hierarchy of investigative thinking reviewed and validated by qualified professionals through their fingerprint, which would be the key to being able to use the system. In this way, it could be possible to create a structure of credibility and trust to build the role of investigative journalism in digital media. This unique usage of digital fingerprint could be used by investigative journalists and other qualified investigators.

Chapter 1. Journalism and Investigative Journalism

1.11. The birth of journalist support tools

The birth of journalist supports tools began with the first algorithm created in the field of news, to be able to help the investigative journalist in the analysis of data.

“Online advertising, while on the rise, has not offset the decline in print advertising. But will ‘robot journalists’ replace flesh-and-blood journalists in newsrooms?” The interrogatory form of this statement, already seen in the headlines above, suggests the potential for the drastic upheaval of journalistic labor” (Carlson, 2015, p. 423).

As Stray (2019, p. 9) states journalism AI research is also hindered by the lack of standard training data sets. While “general” AI efforts such as question answering and document summarization may prove valuable themselves to journalists, investigative reporters also face some unique and uniquely complex data tasks. With regard to the production of information through machines and algorithms, *“story production fundamentally challenges conceptions of the roles of humans and machines in journalism automating the writing of investigative stories seems as if it would require artificial general intelligence, so we should not expect it soon”* (Stray, 2019, p. 3).

One of the most sensitive issues in the production of information and news by a machine is its susceptibility in relation to its acceptance in relation to journalism professionals who have been working in this field for several years. *“Automated journalism’s ability to generate news accounts without intervention from humans raises questions about the future of journalistic*

labor. (...) This anxiety was made palpable in news headlines about Narrative Science automated explicitly questioning the viability of journalism to displace journalists: “Can an Algorithm Write a Better News Story Than a Human Reporter?” (Carlson, 2015, p. 422).

When we talk about the science of narrative, we talk about other areas that are crucial for the understanding and development of platforms and algorithms as proposed in the *CTD*. We are talking here about concepts such as the generation of natural language, the automatic production of leads, the sentiment analysis of a text, among others.

Automation is noticeable with the creation of social networks and platforms used to disseminate news used by thousands of people around the world. “The codification of newsworthiness provides a unique opportunity to reflect on what investigative journalists cover and what they should cover. Rather than simply replicate what newsrooms do now, journalism AI researchers could entirely re-imagine reporting” (Stray, 2019, p. 15).

“Unfortunately, specifying which sorts of fact patterns constitute a “story” is an extremely challenging problem. It is difficult to translate notions of “newsworthiness” into code” (Stray, 2019, p. 18).

Until now, considerations of big data within journalism have sidestepped compositional form so long as journalists still mediated between data and text. But automated journalism’s removal of the human element behind the generation of texts highlights the role of stylistic elements and formulas within news texts. It also leads to concerns that the scalability of news for an audience of one, or multiple stories for multiple ones, redefines journalism from a collective statement to individualized information. Thus, beyond narrative deeper questions

pertain to the state of journalistic authority in the age of automated news (Carlson, 2015, p. 426).

One of the concepts that we believe to be essential for the success of a product as an automated or semi-automated platform, and even the creation of an algorithm, in the context of investigative journalism (considering the analysis and interpretation of different data of investigation) is the incorporation of a journalist who mediates the use of investigative journalists with the platform, that is, who certifies that all processes are conducted accordingly and that the results have value and quality to be used.

“Beyond questions of augmentation or elimination, Narrative Science’s vision of automated journalism requires the transformation of journalistic labor to include such new positions as “meta-writer” or “metajournalist” to facilitate automated stories. For example, Narrative Science’s technology can only automate sports stories after journalists preprogram it with possible frames for sports stories” (Carlson, 2015, p. 423).

Digital technologies and big data are rapidly transforming humanitarian crisis response and changing the traditional roles. *“Sentiment analysis has been used by journalists on social media data as a proxy for public opinion, but investigative journalism use is rare* (Stray, 2019, p. 5)*”*.

We deeply believe that intuition and creativity can be explored and incorporated in the automation process of creating news and information, despite being two human characteristics with some difficulty in replication by computer systems. *“Creativity is a fundamental feature of human intelligence, and a challenge for AI [Artificial Intelligence]. AI techniques can be*

used to create new ideas in three ways: by producing novel combinations of familiar ideas; by exploring the potential of conceptual spaces; and by making transformations that enable the generation of previously impossible ideas (Broussard, 2015, p. 825).

With the tools and technological advances that we are currently witnessing, considering what has been done and achieved so far, we can say that *“the best algorithms will essentially be public interest data mining. They will generate leads, hunches, and anomalies to investigate. It will remain for reporters and others interested in government performance to take the next step of tracking down the story behind the data pattern”* (Broussard, 2015, p. 815).

Here we can also emphasize the role of data journalism in current newsrooms around the world, which is based on looking for stories into databases and other digital collections. *“Data is the practice of finding stories in numbers and using numbers to tell stories It is an evolving practice that may also be called data-driven journalism or computational journalism”* (Broussard, 2015, p. 816).

Although many topics have to be addressed within this notion, we can say that there is a common goal for all those who intend to introduce automation and robotics as a structural complement for the production of information in the current digital landscape, and despite all the ethical conflicts that exist in this use of non-human solutions, we must take into account that *“the social value necessary for any conception of authority derives from both an automation process removing human biases and analytical progress to generate meaning from complex data”* (Carlson, 2015, p. 427).

Chapter 2. Automation and Investigative Journalism

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2.1. Artificial intelligence in investigative journalism

Currently, information comes to us more quickly, through devices with internet access that are available to us. We can rapidly see the weather, national daily news, and international news. Information comes to us in different formats, and in a way, we are also responsible for filtering and sorting this same information. Without noticing, we have the possibility to access content in ways that were not possible a few years ago. Technological advances (and the possibilities that digital allows us also to bring to light the diversity of digital possibilities within journalistic production. The *“number of computational journalists with the technical skills to do a deep investigation of algorithms is still limited”* (Diakopoulos, 2016, p. 409) which leads us to place the growing integration of automated systems in the newsrooms and its viability as a process and work tool for journalists.

With this possibility of being an active agent in the selection of information that we want to consume, we also put in the equation the level that allows us to have this role in the production and dissemination of information. When we talk about artificial intelligence linked with the production and dissemination of information we can also speak about journalism or automated journalism and is currently emerging to be contributory and transformative in the way journalism is produced and understood. *“Robot refers to the generation of news stories by algorithms based on data without human-journalistic intervention and these news stories are then automatically published on news websites”* (Firat, 2019, p. 1). The concept of robot

journalism differs widely from the concept of automated journalism, insofar as the former refers to a system of procedures that, in theory, are not human in nature. This notion is very explicit in the two concepts that dominate this area, namely the concept of artificial intelligence and automation, which are distinguished by the least reasons: the intervention of the human being in the information production process.

The idea of automated journalism vs. robotic journalism are linked to the two processes inherent to the *Connect-the-Dots* platform and what it aims to achieve. After looking at what the journalism career means today and the significance of investigative journalism to restore justice and equity in society, it is urgent to understand to what extent automation and artificial intelligence systems allow an improvement in the quality of life of journalists and how it expands the possibilities of these professionals in numerous fields of investigation.

“Media organizations can be expected to seek efficiency (except perhaps for public media). The efficiency lies in automation, creation of data silos, the construction of AI algorithms that can data-mine new facts and social trends, write the stories, and automatically target the content to the appropriate consumers in the relevant context of media consumption” (Latar, 2015, p. 11).

Here we can measure the extent to which communication companies and newsrooms increasingly integrate the different expressions of automation and robotics. Referring, as stated by Latar, that this modernization in the way of communicating involves the creation of data silos and algorithms based on artificial intelligence. Many other questions arise when using computing and robotics in the production of information and this will be discussed in more detail in the next topic.

“With the emergence of Algorithmic Journalism, the human journalist—the individual—is not the major moral agent anymore as other actors, journalistic and non-journalistic, are involved in news production on various levels, e.g. algorithms with delegated agency, media organizations, programmer/service providers of NLG, or data collectors. Thus, the importance of the individual is diminishing, whereas the importance of media organizations and the media system as moral agents is rising” (Dörr & Hollnbuchner, 2016, p. 414).

In addition to this important need to use computer tools to contribute to the quality of information production, the human facet of the process is increasingly essential to mediate the automation process. Because automation processes have their margin of error, the consumption of digital information itself can become a problem. This information access has its positive and negative sides. The negative aspect of this technological side is that it takes away from us a certain sensitivity to perceive and assimilate what kind of information interests us and is positive for what we seek to achieve with it. Through these new engagement systems that entice us to consume more information, for the fact that it is stimulating information and the result of cognitive processes that induce consumption, extended over time, within a certain platform or website - many mental health problems are now associated with this excess of artificial intelligence in charge of interactions. Regarding this theme of the limitations of the use of digital in information integration processes, the *“Associated Press, for example, has stopped monitoring every single generated text for their earnings reports as it is too time consuming. This monitoring is also relevant on the output level as results are often published autonomously*

by the system” (Dörr & Hollnbuchner, 2016, p. 413). This means, that the initial efforts to mostly test automated solutions can, in practice, become unproductive efforts.

One of the extremes that reflects this dissociation between analogue reality and digital reality is explored in augmented reality processes, which emphasize this addition of the ease of the digital, of accessibility to worlds that often cannot be replicated, such as 3D representation of someone who has died. Thurman believes that *“part of a broader emerging field known as computational journalism (CJ)” and discussed how “digital technology might transform the content of through augmented reality”* (Thurman et al., 2019, p. 9). This means, that primarily augmented reality can be a process to be explored within artificial intelligence in journalism, especially in investigative journalism, when we talk, for example, of recreating environments where a certain crime took place, and it can also be used to explore war crimes in the Ukraine conflict, through the virtual visualization of war scenarios. This could be an important point in favor of virtual reality, which will take the place of the journalist in places where his presence can compromise his life.

With the exponential development of digital possibilities in different formats of information consumption, the notion of artificial intelligence to meet this evolution is increasingly necessary. *“Artificial Intelligence algorithms are becoming fundamental to the survival of society. We are at the dawn of the emergence of a new form of social science that will enable the automatic analysis of the billions of micro social engagements made continuously through our mobile devices and other new media platforms in all fields of human activity”* (Latar, 2015, p. 3). The turning point of our perception of information and the need we have to use digital systems to live our daily lives, makes us rethink the future needs for those who will later need to consume information. Many websites and information systems already fully integrate robotic systems that have little or no human intervention in generating

information. *“AI algorithms are being developed that take advantage of the vast body of knowledge regarding linguistics and natural language, and they are programmed to convert new data into readable stories, without human involvement, in a fraction of a second”* (Latar, 2015, p. 3).

On the one hand, there is the possibility of seeing more, better and in less time, but in the same equation, the strength of excessive exposure to this type of content is placed on the table, taking into account this polarity of possibilities, then the need to see the creation of investigative journalism content within these two prisms: the prism of information faster, more accessible, in less time, but at the same time to what extent it can desensitize, become fleeting and less objective and useful the information that you can create from these automation elements. *“Traditionally, source protection is of high relevance in journalism. With Algorithmic Journalism, it is questionable whether source protection is possible or even desired as service providers and their journalistic clients should disclose all data sources in terms of data transparency. Another important question is whether personal and/or privacy rights are infringed when collecting data”* (Dörr & Hollnbuchner, 2016, p. 412). The *Connect-the-Dots* platform fits into the type of platforms that help investigation and production of new knowledge through tools framed for the journalist's best efficiency to investigate before evidence and data that you want to evaluate, either in the context of writing, or in more practical contexts, in the field. This notion is very important in the context of the production of algorithms, especially with regard to the objectivity of the data collected and its subsequent interpretation for informational use. Diakopoulos (2019, p. 1182) believes that, like journalism, we must recognize that the consistency of an algorithmic process must not be confused with its inherently and deeply socio-technical nature. This notion validates this need to reassess the algorithms and the context in which they are produced. The approaches that can be made to

investigative journalism from the point of view of artificial intelligence are infinite. However, we did our best to choose and frame those that seem to us to be most relevant for the execution of our project.

“Journalism can be built in a number of ways: as a practice, a profession, a business, an institution, a social field, an ideology, and probably some other ways too. Here I lean on the ideological view of journalism, which emphasizes the shared beliefs in journalism about the importance of values like public service, objectivity, autonomy, immediacy, and ethics” (Diakopoulos, 2019, p. 1181). This notion of the plurality of applications of the journalism profession also recalls the different media that it touches, and which are crucial to putting together the puzzle of a news or investigative journalism report. In this sense, Flew et al. (2012) stated that *“data visualizations and graphics can help both readers and journalists cut through dense information in an efficient way”* (p. 166). Such visualizations, they said, could be used to help journalists *“better understand or refine a story”* or for presenting information to readers more powerfully. Hamilton and Turner (2009) discussed a visualization tool called *“Jigsaw: Visualization for Investigative Analysis”*, which had been developed for analysts and researchers but which they thought might be of use to journalists. It offered *“a visual representation of the connections among individuals and entities that may be mentioned across many different sets of documents”* (Thurman et al., 2019, p. 9). For us, one of the main points of comparison in this investigation will therefore be the possibility of creating visualizations of the investigative process or, in other words, the creation of timelines of data related to the investigation, being possible to visually authenticate points of intersection of data and give extrapolation possibilities and conclude hypotheses and conclusions about the topic under investigation.

One of the most imperative references for the progression of our investigation is the work of Diakopoulos and his thinking in relation to algorithmic journalism. *“In the domain of journalism algorithms rarely operate at a level of full autonomy; instead, they operate as mutually enhancing symbiotes with journalists. As a result, algorithmic news production oftentimes creates new types of work for people. For instance, human workers may need to populate data or knowledge sources, configure systems, or supervise and maintain the automation. In practice, what we see over and over again is a hybridization of algorithms with human effort—people must do new types of work to fully realize the value of the automation”* (Diakopoulos, 2019, p. 1182).

Algorithmic journalism is an autonomous process, which, in addition to creation, does not depend on human nature, whereas automated journalism largely depends on the validation and input of the journalist. *“Although not usually visually distinct from traditional — manually produced — forms of news, so-called automated journalism has become a widely discussed sub-genre of computational journalism”* (Thurman et al., 2019, p. 10).

From this standpoint, we believe that technological approach to our problem involves building a journalist's workflow that is hybrid, both in the execution of so-called "analog" tasks and the incorporation of the *Connect-the-Dots* system to support journalist's workflow. *“Journalism and machines come to work together in hybrid workflows a central concern is how people can continue to exert control over the algorithm. Oftentimes with automated systems, control is limited and indirect—typically mediated through metadata—which can frustrate people used to direct point-and-click styles of interaction where an action has an immediate and visible impact on an outcome”* (Diakopoulos, 2019, p. 1182).

Chapter 2. Automation and Investigative Journalism

2.2. Cyber and automation ethics

In 1939 the history of robotics took its first steps when Elektro and Sparko were created. Two robots that simulated, respectively, some human decisions and the representation of a dog. Elektro moved his fingers and had a lexicon of 700 words. 76 years later, a robot that flips backwards was created. In terms of evolution, robotics itself took little more than half a century to evolve in what robots can do, but always having as a starting point the simulation of human procedures. The imitation of what the human being can do is crucial to the notion of automation and algorithmic intervention. *“The developer of one of the first robot journalist story writers, Kristian Hammond of Narrative Science, predicted that ninety percent of the journalistic stories would be written by robots within five to ten years (Latar, 2015, p. 13). The forecast is clear, there is a strong belief that information production processes will be largely automated and even robotic. This hypothesis may even be a reason for reluctance and even some fear on the part of journalists, who, understanding the concept more broadly, may assume that their jobs may be replaced by machines. However, the need arises to understand the effectiveness of automated processes and what it proposes to do within the profession of journalism.*

“AI algorithms do have some serious limitations. Data-mining algorithms are best at discovering new connections between multiple variables with very high statistical significance due to the huge amount of data being analyzed, but the results can be meaningless and add no real value and could lead to wrong decisions. False discoveries can be a function of incorrect questions, incorrect data or incorrect AI procedures. The conclusions that can be drawn from these discoveries can be totally incorrect” (Latar, 2015, p. 13). The illusion that artificial

intelligence can jeopardize a job may itself be too amplified, this because there is still a margin of inconsistencies in the applicability of automated systems in practice.

From an early age, questions related to the production of information related to the use of data or computer systems that use some degree of automation, have arisen. In this context rises the concept of ethics related to the application of these automation systems. A basic notion of journalism that permeates the credibility of automation systems is the fact that the journalist is *“defined as the observer who reports honestly and balanced what happens, careful not to express personal opinions”* (Traquina, 1993, p. 75). To what extent can we assign responsibility to a machine to produce information with “honesty and balance”? What are the factors that lead to making notes that take these two values into account? This will be a point to be explored in the construction of the prototype idea and its variations depending on the research theme.

Therefore, what we are trying to analyze here (from the point of view of scientific thinking) is that there is a list of human characteristics that are not replicable, or at least, that lose their quality level when automated, but here there is also the possibility of creating automated solutions that will complement or add to what the human being cannot do - or at least, that takes longer to perform. Based on this belief, one of the most interesting aspects to explore from the point of view of automation is all the tasks that imply continuity in time and that human beings are not able to perform without rest. *“Since the algorithms are “awake” throughout the day, unlike human journalists, they are able to generate and publish breaking news stories anytime of the day and much faster than a human journalist”* (Firat, 2019, p. 2). Having said that, it is good to envision how those robots or automatic systems will help human beings, in their weaknesses, especially in moments when extra help is needed, or even in contexts that can be differentiating to save lives. We can put on the table issues such as

loneliness, or the impossibility of coexistence with other human beings, which is common in investigative journalism, when camouflaged investigations are carried out or in sensitive contexts, as is the case of criminal investigations or in scenarios of war. It is interesting here to see the evolution of the application of ethics in the field of computational journalism.

“First, there are consequence based ethical theories like utilitarianism (Bentham [1825] 2015; Mill 2006) asking what leads to the greatest amount of good for the greatest number of people affected by an action. Second, duty-based approaches of deontology going back to Kant and Ross ([1930] 2003) are arguing that morality is based on the duties and obligations of human interaction. Third, contract-based theories relying on Hobbes’ Leviathan (Darwall 2003) are speaking of establishing moral systems through societal contracts. Finally, approaches of virtue ethics (e.g. Aristotle 2003) focus on the character of a person asking, “What kind of person should I be?” These moral theories help to capture ethical issues in journalism ethics in general and when dealing with Algorithmic Journalism in particular” (Dörr & Hollnbuchner, 2016, p. 406).

From our point of view, the main ethical issue raised in our prototype concept relates to the total discretion given to a system or a machine in making decisions without human intervention. In this specific case, our proposal for an assistant *“D’outro Prisma”* that aims to inspire other approaches or other perspectives on a given investigation, suggesting the collection of missing data (and the respective intervention in the field to collect this data), giving a supporting initial hypothesis or suggesting new research hypotheses. In this way, the

assistant proposes, at times when the journalist cannot work, to analyze the data included and filtered by the journalist with the help of the *Connect-the-Dots* platform, identify gaps in the investigation and take another look at the initial assumptions. This specific notion can raise ethical problems related to human intuition, namely regarding “*whether a machine can develop journalistic intuition through data inputs*” (Marconi, 2020, p. 63) and likewise trying to understand why “*large news media companies have adopted the practice of robot journalism in the process of generating news stories. The answer is embedded in the nature of online journalism itself, in terms of the need for speed in online journalism, and the economic shrinkage of the online journalism industry*” (Firat, 2019, p. 2). Here we have the notion of two different perspectives, one that focuses on the content produced and the other on its economic viability. The ethical issue is not fear or reluctance to use these systems but made it accessible to institutions of power - capable of using these systems to make them profitable and reproductive on a large scale. As it happens on platforms like *Facebook* or *Instagram*. In any case, we believe that “*automation alleviates activities such as data gathering and interpretation, number crunching, network analysis, sorting, and processing that would otherwise need to be done manually; algorithms allow operators to follow predefined steps needed to accomplish certain goals, identify problems, find suitable solutions in a large set of alternatives, and verify information in a reliable, consistent and efficient manner; and abstraction enables the qualification of different levels or perspectives from which an idea may be presented or new directions that may be explored*” (Flew et al., 2012, p. 159). This array of possibilities largely answers to the need to use information systems in countless methods of application.

What we consider to be the most salient advantage of the use of automation and artificial intelligence in investigative journalism is the issue of reducing the information load

and therefore reducing the time invested in an investigation, which can be transferred to other more important tasks that reinforce the quality of information.

“More time for investigative journalism. Since the algorithms are effective for the generation of news stories, such as sports, weather, homicide, natural disasters, and financial news, that are routinely written but which are time-consuming to produce, journalists have more time for investigative journalism”
(Firat, 2019, p. 2).

On this subject about the need to talk about human exposure to computer systems - to the point that a smartphone, or computer, never sleeps, unless it has hardware to accompany the process, the human being needs that rest. When a journalist spends too many hours in front of a computer or smartphone during investigations, this can have harmful consequences for their health and for the investigation process itself. Because he doesn't fulfill the necessary hours to “reset” the biological system. In a way with unregulated use by humans, misuse of electronic devices can also be capable of developing diseases at various levels. Therefore, the machine has no conscience or intention of causing harm to the human being, but we already know that this is possible, and it is verified in different situations.

“Algorithms require the close supervision of journalists as AI-powered tools become increasingly prominent in the production, processing, and distribution of content” (Marconi, 2020, p. 63). The ideal proposal is that this more expensive work at a cognitive level is processed by the automated system and that journalists supervise this work in a more tenuous way, guaranteeing the improvement of the journalist's attention on tasks he must perform and more focus on what he has to do.

“The key to new computational approaches, of which computational journalism is one example, is to see human-based and computer-driven approaches to sense making as complementary or supplementary. Computational techniques can improve the quality of investigative reporting and news journalism by greatly decreasing the time spent gathering and processing information from increasingly diverse sources” (Flew et al., 2012, p. 160).

These are, in particular, “computer ethics” which refers to moral issues concerning computing, as well as “information ethics” which refers to moral issues concerning the flow and the processing of information. Furthermore, “internet ethics” dealing with ethical issues concerning the internet and focusing on connectivity and the technological fundamentals, or more recently, “machine ethics” or “robot ethics” (Dörr & Hollnbuchner, 2016, p. 406). Here we raised the issue of journalistic responsibility, i.e. human input, and its influence on algorithmic processes (Dörr & Hollnbuchner, 2016, p. 414). With regard to the production of investigative journalism, it must be based on the basic principles of journalism through the monitoring of the investigative process, the verification and evaluation of the information produced, taking into consideration the data included - *“the selection process is personal and arbitrary ; the journalist's decisions [are] highly subjective and dependent on value judgments based on the gatekeeper's set of experiences, attitudes and expectations”* (Traquina, 1993, p. 78). Here we have the real notion that this gatekeeper function is being maintained, insofar as the automated system cannot replicate it in its entirety of intervention. The journalist will be responsible for the data inserted, the data to keep or discard, for filtering information and for choosing the right hypotheses that will be useful to reach conclusions. *“Journalism is a*

combination of art and science. The artistic nature of journalistic work is manifested in the search for new creative ideas, new creative angles to cover a story, new thoughts, new solutions to problems, new ways of enriching life. The scientific part of journalistic work is to employ analytical tools to support and validate the proposed ideas based on data silos where human activity is recorded and stored” (Latar, 2015, p. 14). In this way, we tried to make the system more scientific and emphasize the creative part for the journalist, and when he is tired of looking at his investigation, propose new approaches, new angles of reviewing the information, thus creating new possibilities, new information, new ways of seeing the world, through a different prism.

“Human journalists still have some essential competitive advantages over algorithmic and automated approaches to news production. They’re more flexible and adaptable to a rapidly changing world. They can exhibit creativity both in the types of stories they find and in the expression of those stories as compelling narratives. And they can gain access to important information that isn’t digitized or otherwise accessible to a machine” (Diakopoulos, 2019, p. 1182).

Another inherent component of investigative journalism is its ability to conclude a given situation and its ability to transpose these confluences in a creative and appealing way to readers, whether through a well-constructed report, the use of photojournalism, infographics and even videos, and interaction projects. Generally, the base medium is text, which will then be supplemented or converted into other media. Therefore, the expression given to a news story arises from this ability to transform a certain type of information into another that is more

appealing to the reader. One of AI limitations is that algorithms lack the ability to write opinions. They can provide new knowledge (after validation) but they cannot integrate the new knowledge into suggestions for policy or change. This is a very human endeavor. *“Another serious limitation of AI relates to the ability of AI algorithms to understand human natural language, especially the context of the ideas, metaphors, humor and poetry. There is an ongoing philosophical debate among scholars as to whether machines will ever be able to fully understand the richness and depth of natural language within the cultural and social contexts which are also changing with time”* (Latar, 2015, p. 14).

The ethical and deontological debates that revolve around this theme must also be seen in a constant timeline that considers the different transformations. Regarding the Newsmaker platform described in Marconi's work, being one of the most current platforms in journalism, it helps the journalist *“by recommending facts and figures about the sources, locations, and organizations she writes about – all in real time. The system searches through an archive of past news articles and quickly finds all instances where someone (or something) has been mentioned, retrieving valuable information that contextualizes her reporting”* (Marconi, 2020, p. 61). The first systems to support journalistic activity were based on broader suggestions such as the *“CND systems [that] can contribute to gatekeeping by allowing users to monitor the vast and overwhelming scale of content produced and published on social media platforms. They can help to detect newsworthy events, aggregate responses, and identify, track, and suggest useful sources and witnesses during breaking news or other types of scheduled events like speeches”* (Diakopoulos, 2019, p. 948).

Here, then, we see two distinct extremes when applying automation in the journalistic field. In this sense, it would be useful to compare the integration of the two types of solutions and understand their evolution, from an ethical and deontological point of view, which tools

are useful for the journalist, and which are those that, despite being appealing in what promise, do not actually fulfill any goal. *“Generally speaking, ethics is a sub-area of philosophy dealing with the morality of human action (Prinzing et al. 2015). Morality as “a system of rules for guiding human conduct, and principles for evaluating those rules” (Tavani 2011, 36) and ethical behavior should lead to the common wellbeing of all” (Dörr & Hollnbuchner, 2016, p. 405).* In this perspective, questions arise, such as: to what extent can a journalist support platform help investigative journalists in conflict zones?

In this context, in addition to looking at *CTD* as a platform to support the investigation itself, there may be an “extension” of the platform that supports the investigative journalist on the ground and this is carried out through easier transportation, such as smartphones. In this case, the entry of data and filtering of the same data by a journalist will have to be more unbiased and immediate and must allow data entry through the mobile phone's functionalities. In this framework, the difficulties inherent to field research (in case of investigative journalism) must be highlighted, promoting the safety and health of journalists, especially when dealing with sensitive situations. *“These capabilities help the [journalist] do more investigative work by analyzing massive sets of data and pointing to relationships among data that would be invisible to even the most experienced reporter. The computer handles the numbers, freeing up the journalists to focus on narrative” (Marconi, 2020, p. 69).* In this specific case, the question of machine bias arises. The risks inherent in unchecked algorithmic news generation, the potential for workflow changes, legal liability, and the growing gap in skill sets required to manage this new specialty area.

In what concerns to war context, which is one of the most pressing needs of the investigative journalist today, especially regarding war crimes, it will be important to have this type of technologies in partnership with the investigative journalist, further attesting to their

role as an information mediator in stressful situations where there is a constant need to update information. It is in these times of great tension that technological solutions are proposed- which can help investigative journalists in the field. Allied to information production, platforms may be information capture gadgets without human intervention, such as information seized by drones, based on gatekeeping and human mediation. *“The concept of gatekeeping captures the idea that information can be variously impeded or passed onward in the process of communication. Not all news information is published and made widely available. There is a matrix of forces at play which impact gatekeeping decisions, including individual cognitive differences or biases, work routines for news production, organizational characteristics, external social institutional actors such as advertisers or governments, and social systems such as culture or ideology”* (Diakopoulos, 2019, p. 947).

Chapter 2. Automation and Investigative Journalism

2.3. Investigative reporting methods

Considering the usual process in investigative journalism, we can say that our prototype vision is integrated in the newsgathering process and goes a little way to production stage. *“More time for investigative journalism. Since the algorithms are effective for the generation of news stories, such as sports, weather, homicide, natural disasters, and financial news, that are routinely written but which are time-consuming to produce, journalists have more time for investigative journalism”* (Firat, 2019, p. 3).

As far as investigative journalism is concerned, the methods inherent to the creation of news are more extensive in depth and complexity, and for this to be done, the journalist has to be more discreet and humbler in his approach to the subject, even because he needs that load of humility to get the data he’s looking for. *“In their definition of news, journalists also interact silently with society, through the limits with which social values mark the boundaries between normal and abnormal, legitimate, and illegitimate, acceptable and deviant. The news has a deep structure of values that journalists share as members of society with society”* (Traquina, 1993, p. 17).

One of the characteristics of the investigative journalism method is its ability to collaborate with other investigative journalists. This becomes particularly significant in contexts where there is little information regarding the ongoing investigation, as is the case of war crimes in Ukraine, where the partnership between investigative journalists in the field can be decisive for the security of the reporters. Here we can foresee the use of geolocation (or integration of existing geolocation tools) in the *Connect-the-Dots* system.

“There is no doubt: journalism is a difficult and ultimately dangerous profession, in which journalists face complicated decisions under intense pressure” (Traquina, 1993, p. 18).

As stated by Marconi in his book, there are key values in journalism that artificial intelligence focuses on with greater and lesser intensity. When we talk about investigative journalism, we are talking about a more complex and extended work, which starts from a premise, a fact, or a suspicion, and investigates that theme to discover something, to solve a problem, to answer an issue. The main motto of investigative journalists is the search for freedom and focus on issues in which they must struggle with other spheres of power. As we can notice in the hierarchy pyramid of society, the journalist is assured with the notion of press freedom (a concept introduced by James Mill – where he defended the almost absolute freedom of the press and advocated an important role for the press (Traquina, 1993, p. 34) to support his work, trusting that society will give him the worth and authority to question some other domains of power. The journalist deals with starting questions, or guiding questions that will lead him to proceed with the data available, as well as knowing what data he needs to search in the investigation.

“Journalists invented new forms, new practices, new techniques, and a series of values that contributed to a professional identity. Despite the exciting rhetoric about the role of journalism and democracy, members of the profession under construction faced constant threats, low salaries, difficult working conditions” (Traquina, 1993, p. 58).

Another issue raised regarding investigative journalism methods is that they are formally more arduous and expensive than current journalism. This leads to greater interest in finding technological solutions for the more time-consuming and expensive processes of investigative journalism, in order to help these journalists throughout the creative process so there is a consequent increase of projects in this area, thus being a lever for investigative journalism, which has shown a strong decline in recent years. *“Watchdog journalism, by its definition, sought to “hold leaders accountable, unmask malfeasance, and make visible critical social trends”. It was a means of providing citizens with “the information they need to make many important choices”* (Thurman et al., 2019, p. 1).

As far as investigative journalism methodology is concerned, it should be clear from the start what is the purpose of the investigation, what it is intended for, to find investigation facts based on key concepts and investigative tools to be used. So, the first step in the investigation workflow is to identify what you want to know, thus recognizing the keywords and guidelines for the entire investigation.

It is significant to know if there is data the journalist has in his possession and wants to integrate, then there is a need for the platform to analyze this data so that it can be used in a useful way by the journalist. *“Sometimes these decisions are chained in order to form higher-level decisions and information transformations, such as summarization, which uses prioritization and then filtering operations to consolidate information while maintaining the interpretability of that information”* (Diakopoulos, 2016, p. 402).

This is the key question in this investigation and the one that led to the identification of a very precise need among investigative journalists in Portugal, especially investigative journalists who worked on the *Sexta às 9* program. Here, the real need was to shorten and reduce the time applied in the analysis of these data, particularly documents of public domain.

In the next chapter, this topic will be addressed more precisely, but one of the conclusions we reached from the RTP experience is that it would be extremely useful to develop a technological solution that generates a visualization - a timeline, an investigation visual map, capable of giving an overview of the investigation.

Another string of research has studied visual analytic tools for investigative journalists, revealing different news discovery use-cases depending on whether users already had a hypothesis to verify (Brehmer, Ingram, and Stray 2014) or were more interested in hypothesis generation (Felix et al. 2015) (Diakopoulos, 2019, p. 949).

Another interesting topic about journalist investigation methods is the need to use physical/analog data as well as digital data. In some investigations (in which later periods of time must be analyzed) there may be photographs, documents, newspaper clippings, videos on film, tape recordings, among others, that need to be crossed with more recent data, which may be in digital format. This is very common in investigative journalism, particularly when the time spectrum of investigation is very wide, *“here, journalistic expertise (rather than being able to query data) is more important, and digital innovations are hardly an advantage. Digital practices are molded into the journalistic process and made to fit with traditional practices, each of them serving specific causes. Digital practices are thus re-invented through their use and are not utilized as originally intended practices”* (Kunert et al., 2022, p. 776).

Regarding data processing from a digital point of view, there are other subjects that must be considered, in relation to investigative journalism methods, such as data transparency, a very important necessity for investigative journalists. In this case *“transparency is far from a complete solution to balancing algorithmic power. When corporations or governments are not legally reversed or otherwise encouraged to disclose engineering information about their algorithms, we might consider a different, more adversarial approach employing”*

(Diakopoulos, 2015, p. 409). One of the things that must be considered in this situation is that the frugality of digital data and its rapid existence in today's multiple information producers can itself be an obstacle in the perception of digital data, coming from different databases, especially those that are built by the common citizen. As is the case of *Facebook* and *Instagram*.

Chapter 2. Automation and Investigative Journalism

2.4. Machine learning and storytelling

When journalists are studying data they have available for their investigation, they start by doing a brief research on the subject on the internet, then they compare articles already published on that matter, revisit newspapers, radio soundbites, television episode, analyzes related photographs, sometimes photographs that were sent to them, other times finding them on the internet, under a certain investigation of the digital footprint of the people involved, in the case of a scandalous statement, the journalist can analyze the sound, or in a video check evidence that leads them to discover what they want to know. *“One implication of extending computational methods and techniques to journalism is that computational journalism can bring information technology specialists and journalists together in order to develop new computing tools that are associated with the aim of providing information that is accurate, original, reliable, and socially useful”* (Flew et al., 2012, p. 158). The investigative journalist analyzes all the elements and takes some notes on a paper about process key ideas/issues. Sometimes it is through this analysis that the most interesting ideas for writing his story emerge, or it is just one of the steps he must take to reach the results. This intuitive process and information detachment/debugging is organic and often the idea of investigation is a real find.

One of the ways to transform this information into more relevant information blocks for the construction of the journalistic narrative is through the practice of *“machine learning – [that] simplifies complex ideas into smaller, more approachable tasks that ultimately lead to a designated end point. There are three main types: “supervised”, “unsupervised”, and “reinforcement learning”. These ML paradigms help reporter draw conclusions from large*

corpora of data” (Marconi, 2020, p. 77). This process of translating more complex information into more perceptible material is adjusted through the input of the journalist. In this sense, another type of question arises related to the adaptation of unmonitored data, namely to what extent a machine can do this intuitive process of debugging the information or how can help the investigative journalist to reach this result?

This question brings up the possibility of understanding the automation process as a development that will fill the gaps of the human being, or also automation as a significant sustenance of the intuitive process innate only to human beings. By this we mean that the reinforcement of intuitive thinking can exist here through small bridges created from artificial intelligence. Processes throughout the newsroom can and should be automated when possible. Applying AI to a certain activity (for example, adding metadata to stories) can dramatically reduce human error and improve the overall uniformity of how content is labeled (Marconi, 2020, p. 71).

This ability to position themselves in the face of the connection between the journalist and the automation processes – semi-automated platforms – highlights what has already been discovered and what must be recycled with regard to the algorithmic design or support for the journalist. In this case, the “*computational news discovery - a particular application area within computational journalism related to the use of algorithms to orient editorial attention to potentially newsworthy events or information prior to publication*” (Diakopoulos, 2020, p. 945) can serve as a conceptual basis for the outline of the assistant that we intend to propose in this investigation.

We believe that the way to help in the investigation process of pre-existing data is to add tools that will help to understand elements that may be of interest in the investigation and use artificial intelligence to highlight the most important information and thus continue to leave

the element of intuitive abstraction for the journalist, reinforcing here the platform can be useful in this process of intuitive abstraction through the visualization of crossing data in a visual map (similar to the game “connect the dots”). When we talk about visual maps, we are talking here about a visual board of all elements that are most prominent in the investigation, we are talking about iconographic representations of certain aspects of the investigation, such as photographs of the people involved, highlighted quotes from interviews, sound excerpts with less of one minute of information relevant to the investigation, GIFS of looped video portions, to enlarge a certain scenario, representative numbers of information to highlight (for example 58% of Russian soldiers), in short, everything that could be useful in a first glimpse, which can be placed in a connected framework to inspire and develop the investigative journalist's critical spirit in the face of presented data. In this way, *“enhanced visualization tools and interactive multimedia and graphics enable journalists to present key themes of investigations in more powerful and useful ways”* (Flew et al., 2012, p. 164) so we decided that methodologically we will opt for the research orientation through of the design necessary for its final presentation. *“A design orientation in journalism studies would mean an increased emphasis on studying how the artifacts of algorithms and automation can be created to support journalistic goals. Articles in this genre would strive to articulate design guidelines based on human-centered studies of technology in use”* (Diakopoulos, 2019, p. 1183).

In addition to this transformation of research data into a representation of these data in a more eye-candy format, it is necessary to emphasize that the connections between these information, represented on the platform through connecting lines, strings that connect point A to point B, can be differentiating in the investigation process. When cross-referencing certain data and discovering their connection, new paths of investigation may emerge, new understandings to follow and ensure a new way of seeing what has already been discovered.

Under these data that are introduced by the journalist, combined with the data introduced by the system, through access to the database, the concept of “*natural language generation (NLG) [that] enables the automation of repetitive tasks like writing news articles is applied that follow a well-defined structure*” (Marconi, 2020, p. 82).

After this first transformation, we verified the emergence of less complex data and more oriented to the journalistic production process, which now in more digestible blocks may have a more significant impact on the journalist's critical thinking. It is also necessary to take into account that “*in the automation process, the journalists are also responsible for ensuring alignment with the newsroom style guide. This includes making sure that the spelling of certain names, titles, numbers, and figures is the same as in any other story published*” (Marconi, 2020, p. 90). Hence, we realize that it is not easy to integrate into the system all types of guidelines that change from newsroom to newsroom, so we suggest that there is space to tailor the type of information to the needs of the journalist, which can be included in the account sign-up process of the journalist, having a platform adapted to their needs, or by filtering information with a range of options that meet this differentiation in the style of news publication.

One of the ways to make this product is through the identification of newsworthiness criteria, as well as the parameters of interest in the investigation. In this situation, it will be interesting to understand how this type of platform was built, considering the guidelines of each media outlet.

“For smaller news organizations or independent journalists, it is generally advisable to get started by testing several partner tools before proceeding to build one’s own tools” (Marconi, 2020, p. 75).

By combining these two parameters, newsworthiness, and investigative interest, it is necessary to teach the system to debug information according to these filters and thus arrive at more precise and concrete data about the investigation. These two major categories of newsworthiness and investigative interest will be two major filters throughout the ongoing investigation and may be two bases that regulate the automation processes of the platform. If we focus on *“on augmentation when a human task can be improved through the help of a machine. This is the right choice for complex tasks that require a lot of computational power – for example, analyzing a large dataset of financial data as part of investigative piece”* (Marconi, 2020, p. 71). Thus, we can conclude from a large data set, which of data are newsworthy at first and then understand if they have interest for the investigation. So, we talk about a filtering over another filtering. As we saw in the first chapter, regarding the degree of newsworthiness, this can be achieved by filtering information according to news values, since in terms of investigative interest, we think it is pertinent for these interests to be more fluid and to be demarcated by the journalist himself when using the platform, which will consider the guidelines of the media as well as the interests as a researcher.

In this specific case *“we can begin to assess algorithmic power by analyzing the atomic decisions that algorithms make, including prioritization, classification, association, and filtering”* (Diakopoulos, 2015, p. 401) steps that will be explored at this level of the *Connect-the-Dots* platform, then, in strategic steps of information revalidation, it will be essential to for the researcher to analyse the data with his own eyes because *“sometimes a human operator maintains agency and makes the final decision in a process, but even in this case the algorithm biases the operator's attention toward a subset of information”* (Diakopoulos, 2015, p. 401) which can make the result of content debugging richer, as well as introducing a percentage error in the analysis of data. On one hand, semi-automated systems can be more neutral and

impartial than journalist himself but, taking into account that the journalist will limit the performance of the prototype concept according to his beliefs and validation systems, the system will replicate these beliefs and validation systems as being the most correct. *“In addition to the potential for uncertainty and mistakes, classification algorithms can also have biases. In a supervised machine-learning algorithm, training data is used to teach the algorithm how to separate classes. (...) The algorithm learns how to classify based on the definitions and criteria humans used to produce the training data, thus potentially human bias into the classifier”* (Diakopoulos, 2015, p. 402). This can largely represent an interesting way of exploring the journalist's intuition towards the machine, but on the other side of the coin we can also amplify human error on a scale disproportionate to human intervention.

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2.5. Automated investigative strategies

Journalistic procedures vary depending on the journalist, the newsroom, and the media in which the investigation will be published. However, it is possible to find a standard workflow that is verified in the different journalistic procedures. *“Since the development of computing in the mid-1940s, machine or artificial intelligence has become a significant sub-domain of computer science. Classic subjects of investigation within this field are vision, language and speech processing, robotics, knowledge representation and reasoning, problem solving, machine learning, expert systems, man-machine interaction, and artificial life”* (Flew et al., 2012, p. 159). These standard procedures are those that can be replicated in the different areas of computing field at journalism level, but regarding investigative journalism, which investigative processes will be most interesting to replicate?

“These types of artificial intelligence programs can give journalists the power to identify patterns and trends from multiple data sources, remotely analyze scenes in the field for objects, and texts, and even better understand tone and sentiment from sources” (Marconi, 2020, p. 57).

We can speak, in a first approach of problem solving, machine learning, and man-machine interaction, when we talk about the approach and goals of the *Connect-the-Dots* platform. Through these lines of investigation, we identified that it is more fascinating to identify patterns and understand the tone and sentiment of journalistic sources. *“By performing*

repetitive and laborious functions at scale, AI is helping the Newsmakers colleagues to engage in more complex, qualitative reporting” (Marconi, 2020, p. 60), we also identified that summarization of texts, the identification of data with informative similarities or antagonisms and their organization based on criteria chosen by the journalist. As we mentioned in the previous subchapter, there are specific guidelines that differ depending on the media, and these guidelines determine what should or should not be included in the report. We take as an example the editorial rules of National Geographic – which may filter the information for each investigation and then transform it into a report that focuses on editorial design, or a report that focuses on a documentary (by way of example). It is our intention to help journalists of this genre create an investigation viewing timeline that helps them navigate investigation data, just as National Geographic's target reader does in meticulously crafted content. It is not surprising that NG is known for allowing stunning views of specific journalistic narratives in the World and Universe, so believing that this kind of care with visual information conjugated with the quality of information during the research process can be an inspiring motto and a strong motivational basis for the investigative stages where the journalist feels “lost”.

When we talk about the possibility of automating certain tasks that are more complex for the journalist, we talk about increasing the possibility and qualities of a certain investigation. *“By leveraging stigmatization technology, the Newsmaker can automatically turn a long article into a mobile-friendly post. This process relies on a type of AI called natural language, a class of algorithms that helps computers interpret and manipulate human language”* (Marconi, 2020, p. 44). If we manage to transform a series of large texts, for example 30, into 30 small paragraphs combined with a representative photograph of these texts and we have these 30 paragraphs with the photographs on the side on an A3 sheet, in a chronological way, for example, the journalist can view the 30 texts at once on a large map, highlighting their

main words. In the same way, we can talk about document classification and the visualization of their combination by keywords.

“In a story for the Associated Press, data journalists Jonathan Stray used text analysis tools to comb through 4,500 declassified documents related to private security contracts in Iraq. This culminated in a story about why and when U.S. hired these private contractors” (Marconi, 2020, p. 101).

When we talk about these processes in a more general way, we realize how important an automatic data visualization system can be in the process of abstracting the journalist's critical thinking. We identified that it would also be interesting to choose a representative icon for the investigation, appealing to the semiotic instigation on the subject. Let's imagine that we are investigating "The Life of Jesus - Reality or Myth", one of the great investigations made by National Geographic in 2021, in one of the approaches to the time of Herod, the King who ruled when Jesus was born, a 3D simulation of the temple, explaining the usefulness and functionality of each of the buildings. Therefore, for this subchapter of the investigation on the life of Jesus, it was chosen to choose the temple of Herod as an iconographic representation of Herod's mandate. Herod's temple is also used as an evolutionary timeline that talks about the constructions that were made in the same place, one on top of the other. Which tells us a lot about the city of Jerusalem through time. Therefore, the categorization of data, aligned in a certain way, on certain guidelines can show innovative angles on the investigation and a change in the classification of data can even change the direction of the investigation itself. *“When publishers distribute content to a smart machine, the way that a device speaks on a language of categorization – a taxonomy. Words are organized into categories, such as whether they are*

referring to a person or a place or even a date, which then triggers an output” (Marconi, 2020, p. 107).

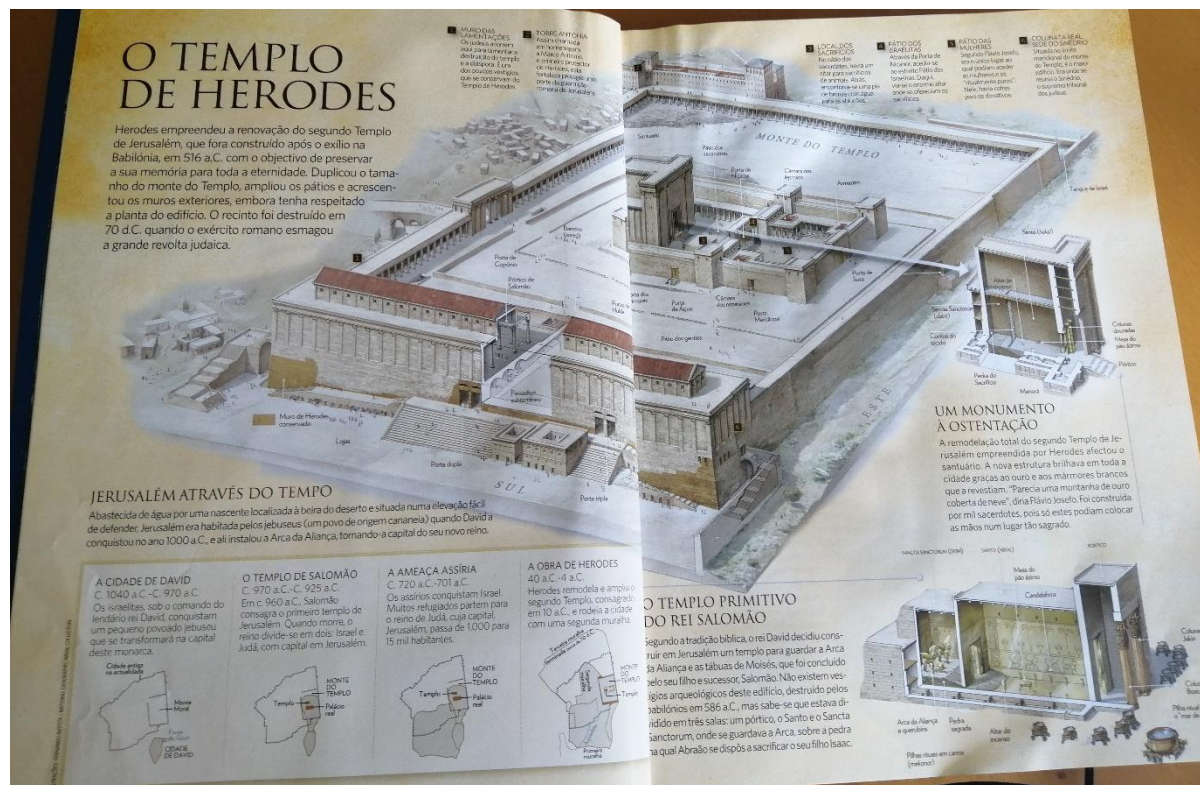


Figure 1 - O templo de Herodes, infographic from National Geographic Magazine

Here it will be important to highlight the role of summarization and categorization of information and we can also think about using the same process in building leads, as is the case with RADAR, to create small paragraphs over longer texts. *“In some cases, such as for the leads produced by RADAR, the leads could be published as-is, largely because they had already had substantial human editorial development before being distributed as leads”* (Diakopoulos, 2020, p. 952). Once we have access to a lead for each document, or for each chapter, use that little text in a lead, that paragraph in a visualization, in a visual timeline.

Within this scope of investigation, it is necessary to define what type of automated solutions are most useful in the context of journalism, specifically in the data analysis phase and in the data interpretation phase. Within the area of automation within investigative journalism, we believe that the tool with the greatest potential to help the investigative journalist in the investigative process is filtering. *“Filtering involves or excluding information according to various rules or criteria. Inputs to filtering algorithms often take prioritizing, classification, or association decisions into account”* (Diakopoulos, 2015, p. 408). As Diakopoulos explains, within filtering we have three major groups of data analysis – prioritization, classification, and association. Therefore, these three large groups will be responsible for debugging the data that will later be placed on the visual map. We propose a tool that is not intended to replace the journalist's tasks, but rather to help in these tasks and in the investigative procedure, proposing ways of thinking better and reaching conclusions faster. If we think of investigations that are based on a concrete space, such as transformations of the city of Jerusalem, or more recently, the Russian military occupations in Ukrainian territory, we can base ourselves on geographic systems to understand the evolution of a conflict, to understand the existing data by year, and include, in the form of filters, the data that we want represented in the visual map. *“Another example where computer journalism on data visualization comes with the proliferation of consumer-level Geographic Information System (GIS) and monitoring draw maps of mapping programs, such as Google Maps, that enable the layering of variable data to show clusters or patterns localized information”* (Flew et al., 2012, p. 164). By including this type of possibilities, somehow open-sourced, it may be possible to have a general map of research data and change this view depending on the research stage. To this end, we refer to the interactive documentary 'Sons of Galipoli' as inspiration for this kind of interactive timelines on large databases. Despite having been a highly valued project at the

time it was built, it was not continued because it was a very broad and very diverse project. Will it be possible to use its methodology so that it can be applied in different investigations, and similarly to National Geographic, apply quality data visualization for journalists themselves?

Another issue that we think is relevant to focus on is the cross-referencing of information by topic. Imagining *“newsroom transformation is not about technology; it’s about cultural change. This starts by fostering an environment where journalists are encouraged to pilot, to fail to get feedback, to iterate”* (Marconi, 2020, p. 53).

Another issue that is significant to address is that we consider useful to create a meme that expresses emotions regarding the visual content, and this is where the role of our assistant proposal “D’Outro Prisma” comes in, a small, animated prism that intervenes in the investigative process, just like in Word in 1995 with the small clip that supported us using Word. This small prism would then be the researcher’s best friend, which would help him to see the investigation ‘N’Outro Prisma’, in another perspective, and works exactly like an assistant that collects the information it needs throughout the process. We can speak in this specific case of procedures such as NLP, the generation of natural language, process mining, the creation of algorithms and the use of annotations. *“Natural language processing (NLP), a sub-domain of AI first developed in the 1950s, can come in handy in these situations. NLP is able to recognize the structure of sentences, understand the semantics of text, and identify people, places, organizations, and concepts in documents”* (Marconi, 2020, p. 100). We are talking about fully automated help on two fronts, finding new angles of investigation that the journalist has not yet noticed, monitoring the time of exposure to LEDs in terms of being harmful to the journalist and the investigation itself and proposing a new data collection that the assistant believes will help the investigation. In a first phase, it can be done through

“reviewing social media, public records, news archives and forums, and other sources faster than the Newsmaker can blink - AI brings a new perspective to journalism” (Marconi, 2020, p. 31) as also the possibility of returning to the field to collect evidence, including photographs, videos, sound clips, statements, in short, whatever is relevant to advance the project.

“There are three specific practices that can aid newsrooms in this optimization: structuring data, providing context to the machines through news taxonomies, and improving pronunciation guides and writing style” (Marconi, 2020, p. 106).

Other relevant features of D’Outro Prisma you can monitor is the inclusion of data according to previously identified guidelines, and here we would train or teach the assistant to work on this type of guidelines. This process could be done by the journalist as soon as he made the first integration into the system. These resources were widely used in automation projects, but without this 2D expression of a cute prism-shaped assistant in newsrooms, so it must be analyzed in their context and in the possibilities that might bring to the newsroom. In other words, understand which of these tools are useful to journalists and understand their functionality before applying them to the assistant. Because *“an algorithm can be defined as a series of steps undertaken in order to solve a particular problem or accomplish a defined outcome”* (Diakopoulos, 2015, p. 399) and the goal of the D’Outro Prisma (*DODO*) assistant is to lead the investigative journalist to the final discovery.

What is most important to keep in mind is that artificial intelligence and the use of computers and smartphones are here to stay, and obviously the use of these tools also arises to help human beings to go further in their tasks. *“The complexity of these data results shows that no matter how sophisticated such systems become, humans will still have a central role in*

defining best practices for the machines and interpreting results” (Marconi, 2020, p. 34). So, from the point of view of what has already been discovered at a scientific level in artificial intelligence in investigative journalism, is that *“people should be involved in evaluating the leads produced by CND systems. (...) Despite the varying degrees of evaluation an algorithm might itself encode, human evaluation of leads was seen as essential in at least three areas: (1) lead development, (2) newsworthiness assessment, and (3) quality assurance”* (Diakopoulos, 2020, p. 952). In which data will be filtered to meet the degree of newsworthiness and investigative interest, all visual elements will be placed in small icons by priority, from the largest to the smallest. The most important documents will be converted into leads, the data will be grouped visually depending on the typification, the associations between data will be red lines and the arrangement of this data is changed according to the positioning in the timeline, so it would be helpful if journalist would have skills like *“programming, design, typography, info graphics, usability, databases, Web, and journalism”* (Kunert et al., 2022, p. 764).

During this process of filtering and sorting information on a visual map, it will be complemented with the support of the *DODO* assistant that will provide investigative clues to the journalist or other researcher. However, there is also a need to understand to what extent automation can be rudimentary and even able to disrupt usual procedures. An issue that can be directly linked with the bias reflected on the initial training of the assistant. *“Nevertheless, data visualizations may provide a platform from which professional and citizen journalists can identify further news items”* (Flew et al., 2012, p. 164) and *“«automation allows news organizations to distribute higher volumes of content at lower costs, and also to produce entirely new content that would have otherwise been too expensive to create”* (Marconi, 2020, p. 47). In this way, we highlight the feasibility of the process in terms of recovering the

journalist's time to focus on tasks that will bring more feedback to the investigation and giving the possibility to explore themes that would otherwise be set aside due to their practical and economic infeasibility. It is fair enough now to try to understand how technological tools can be used by investigative journalists worldwide, both those who are included in media literacy and those who prefer to work with the standard tools. As in the new Mister Been series (Man Vs. Bee), in which he struggles with the range of negative results from the use of artificial intelligence.

“A Pew Research Center study found that 44 percent of young people aged eighteen to twenty-nine have deleted the Facebook app from their phone and 64 percent have adjusted their privacy settings in the last year” (Marconi, 2020, p. 32).

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2.6. Patterns in journalistic workflow

Finding a pattern of journalistic stages is not always easy for reasons that we already highlighted in other chapters, but it is important to emphasize that journalistic stages within the scope of investigative journalism differ in depth and in the context of current journalism. *“Computational journalism, they said, might create “new blendings of audience, reporter, and commentator ... [that might] grow the audience for watchdog and enhance the involvement of citizens in the democratic watchdog process”* (Thurman, 2019, p.6). For instance, in investigative journalism there may be more of a desire to leave no stone unturned (Diakopoulos, 2020, p. 954). Thurman and Diakopoulos agree on a concept, which we identify here as a watchdog process that, in essence, seeks to lift all the investigation stones. It is an attentive, detailed, meticulous, and fair procedure. Because the investigative journalist seeks above all justice, even that which is above the usual justice. For it to work in this way, it is essential to take into account this rigorous methodology, because only in this way there will be results that can be replicated and accepted by readers. Thinking of the journalistic procedure as a recipe, as is done to try to explain the procedure of an assistant, may not be a good practice to understand how the investigative journalist examines, because we are not talking about a watertight procedure. In the case of watchdog journalism, *“the relationship between source and journalist is sacred, and is manifested in the importance that the journalistic community attaches to the right to professional secrecy”* (Traquina, 1993, p. 115). Therefore, we can identify the first mutation parameter being the alteration of the sources when they are inadequate. One of the parts where the prototype idea can be useful is to attest the credibility

of the available sources “*with the software able to “scan” and make decisions based on relevance and timing and provide context with reference to a reporter’s previous work*” (Thurman et al., 2019, p. 7). Another significant feature in the production of investigative journalism is its fluidity between formats “*to switch between media formats (e.g. turning data into text and text into video), and repurpose content customized to various audiences*” (Marconi, 2020, p. 6) can be important when there is cross validation of information in different setups, a photograph that is evidence in agreement with a status report, a surveillance camera video that shows the same person as in another video filmed on television. In a way, it is urgent to understand that data and information are shaped in the sense of verifying something, and the journalist uses what he has at his service to show that he is right and that the data he has collected are sufficient to sustain his hypothesis.

The investigative journalist's workflow is not linear and does not always use the same elements. There are many variables to consider, and the procedure may have to be repeated, or stitched together depending on intermediate discoveries, apart from the appreciations and abstraction processes that are vital for the progress of the investigation.

“The whole mythology of the reporter, of the «great reporter», of the investigative journalist, represents the journalist as a hunter” (Traquina, 1993, p. 168).

So, the journalist hunts for what he is looking for, he goes looking for something to show the world that he is right. And the reader or viewer only believes in what the journalist assumes because he is shown irrefutable and undeniable evidence about what he wants to convey, in a way “*news is the result of processes of social interaction, not only between*

journalists and sources, but also among the journalists themselves, seen as members of a professional community” (Traquina, 1993, p. 126).

One of the resources that we consider most powerful in this display of evidence is the image, because the image symbolically, despite being able to be digitally manipulated, is sufficient to show the veracity of an event. That's why we consider important to include images in the research visual map, especially to discover more evidence about a topic. We speak here of *“image recognition [that] allows video editors to locate scenes and moments in raw footage- something that’s traditionally been done through manual tagging, which is often inconsistent when done by multiple people”* (Marconi, 2020, p. 112).

This system of image data process can be very important to decipher some tangible hypothesis, when there are two sources of image data and it is necessary to understand if, for example, the people involved in the photo are the same. Sometimes the photographs themselves will not be used in the final report, but they need to be analyzed to reach some intermediate conclusion. But if this image is included in the final report, it is necessary to strongly validate whether that image is true and to what extent its exposure can help restore justice to a situation. In a way, *“journalism and journalists can influence not only what to think, but how to think”* (Traquina, 1993, p. 128) by providing selected and filtered information on a given subject, which may bias the user's opinion. *“The simplest of leads reflecting the message “something has changed” could at times be the most effective for drawing attention from human journalists who could then make a further assessment of the significance of that change”* (Diakopoulos, 2020). Due to this fact, we also propose to understand how journalist's intuition and input, throughout the use of the software, can improve and amplify the results of the system or negatively influence the automated process.

“In response to the question of 'how events become news', Galtung and Ruge enumerate the following news values: 1) the frequency, that is, the duration of the event; 2) the magnitude of the event; 3) clarity or lack of ambiguity; 4) the significance; 5) consonance, that is, the ease of inserting the “new” into an “old” idea corresponding to what is expected to happen; 6) the unexpected; 7) continuity, that is, the continuation as news of what has already gained newsworthiness; 8) composition, that is, the need to maintain balance in the news due to the diversity of subjects covered; 9) the reference to elite nations; 10) the reference to the milk person, that is, the heat-news of the prominence of the agent of the event; 11) personalization, that is, the reference to the people involved; 12) negativity, that is, the value that is governed by the maximum bad news is good news” (Traquina, 1993, p. 179).

Throughout the investigation supported by the system, the journalist or other researcher, can analyze the process and the data and re-educate the system/algorithm in what the journalist considers most relevant to the investigation, which is reliable and is more likely to be useful within the investigation. However, in the same way that there are journalists who seek to validate their hypothesis with real evidence, we also must consider the danger of helping the investigation processes, because there are some investigative journalists who try their best to assert their perspective, to the point of create their own data and evidence to reach the expected conclusions. Here we refer to the movie “Nightcrawler” which clearly explains the concept. *“In the language of Molotch and Lester, some news is generated by journalists who will 'dig up' it. For example, professionals in the journalistic field, when examining the police*

record, can detect that «crime is on the rise» and put the issue of crime on the political agenda, thus becoming active participants in the construction of reality” (Traquina, 1993, p. 113).

Therefore, the automated procedure cannot be watertight and completely arbitrary to the algorithmic processes because there are inherent characteristics of investigative journalism that cannot be replicated by an automatic information system. *“For example, using the AI-powered News Tracer platform, Reuters has been able to sift through emerging topics on social media to determine if they are newsworthy and truthful, which helps reporters monitor events and find relevant stories more quickly” (Marconi, 2020, p. 30).* Likewise, the same procedure can be applied throughout the prototype vision to attest to the viability of what is being produced. Another way to regulate the use of the platform may be to create a physical ID for input in the system, but it is a debate to be pursued further in this investigation.

We believe that the usual procedure of automated investigative journalism follows the following steps *“(a) the extraction of the data, (b) the evaluation of whether the data is newsworthy, (c) the determination of appropriate data for prioritization, (d) the association of suitable data with the news, (e) the generation of a news story, and (f) the automatic publication of the story on a news website” (Firat, 2019, p. 1).*

These steps will be fundamental to identify our initial procedure, adding other steps that will try to recreate intuition by the machine, giving space for other corresponding sciences to act, as is the case of psychoanalysis, cognition processes, and application of neuroscience in robotic systems. In this case, we can talk about the analysis of the degree of newsworthiness, being able to define *“the concept of newsworthiness as the set of criteria and operations that provide the ability to deserve a journalistic treatment, that is, to have value as news” (Traquina, 1993, p.175),* this being the first criterion for selecting data that enter the *CTD* system and then we can talk about processes of *“atomization [that] refers to a news story being broken into*

“atoms” (or objects, units, or components) of discrete information, which algorithms and automation can then recombine into adaptable and scalable news products” (Thurman et al., 2019, p. 986).

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2.7. Artificial intelligence in work-field

“China’s Xinhua News Agency created the world’s first AI news anchor, a digital replica that resembles a human journalist” (Marconi, 2020, p. 3), and considering this discovery, we can think that the same could happen to journalists in the field. When we think about the practice of journalism in the field, we must consider that the journalist does not follow a linear procedure, as we can find in theory in procedures related to field investigation. In many cases the workflow is intuitive and adjusted to what is happening now. The journalist seeks, in the sea of events that he meets, the answer to the questions he needs to answer. Especially about investigative journalism in which the reporter is hunting his prey, his story, the "how" and "why". When we propose to help the investigative journalist in the field, we also think about everything that will need to be considered so that this help is effective in the best possible way.

“The strength of computational journalism relies on the integrity, quality, and reliability of the data available: a central concern for both journalism and information technology. Statistical anomalies, a lack of sense, misinterpretations, conflicting data standards, incomplete data, skewed results or malignly altered data pose serious problems. The misuse of data includes exposing or trading private data from datasets that should be aggregated and de-identified” (Flew et al., 2012, p. 167). These anomalies can be preponderant and even more serious when found in the context of terrain where the journalist needs maximum confidence in the system he is updating. How can we attest to the integrity, quality and reliability of the processes and data presented on the platform? Considering this almost instinctive procedure of the journalist, it becomes more complex to apply computational and reproductive methods to help the

journalist in field. It is not that it is impossible, because it is not, and the proposed prototype concept aims to overcome this difficulty, but we can say that it is a complex process that needs to be adjusted to real needs of investigative journalist in the field.

“When algorithms become widely used, when they fail, and when they are misused by humans, they can lead to significant consequences, such as discrimination, revenue loss, privacy breaches, and more” (Marconi, 2020, p. 112).

Usually, the investigative journalist goes on field research when he needs to be convinced and needs to find proof for his investigative premises. You can do this through interviews, photojournalism, non-participant observation, replicating a scenario, reviewing the steps of the person in question. Regarding this type of investigative approach, it is urgent to think about what kind of tools can be useful in the field. In a first stage, we believe that it is pertinent for the journalist to have access to a summary of the investigation and data that have been the most decisive so far. From this information, the prototype idea will be able to suggest data to look for, complementary information capable of validating the information. This suggestion of the state of the investigation (and what might be useful to discover in the field) takes us to the hybrid automation processes advocated by Diakopoulos and how they can be more useful in the journalistic field, than the exclusive addiction on digital and computational systems. One of the most important tools, that can be included in the system, is the introduction of new data directly from the device used, such as photographs, videos, sounds, texts. If it is difficult to read information through documents, it may be interesting to use tools that transform text into easier means of reading them in smaller devices. *“Automated text-to-visual*

platforms detect the topic of a text story and find correlated videos and images to add a multimedia element. A reporter might write an article, upload it to a platform, and a few seconds later have a fully relevant video piece to accompany the original article” (Marconi, 2020, p. 115).

One of the tools that we think is vital for the data integration are the data collected by drones, thus reaching places and situations that could sometimes be impossible for the journalist to reach. However, this possibility, as stated by Gynwild, can be volatile as the equipment is fragile and the population's trust in drones is very low, and they can be considered intruders most of the time. We believe, however, like any outlandish innovation, that over time the journalistic community and the public will be able to see this solution as an opportunity and not as a danger. The solution lies in young researchers and users of social networks giving rise to the integration of generating ideas that go beyond the voluntary production of information. We are talking here about the possibility of creating specialties that master robotics instructions, that are capable of programming to inform and, as Sota says, that can create a vast repertoire of investigative programming that can be based on platforms such as *Connect-the-Dots*.

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2.8. Newsroom collaborations

One of the great topics of scientific discussion, concerning automation processes in newsrooms, is the topic of collaboration between newsrooms, especially in what concerns algorithmic journalism processes. One of the particularities of doing this collaborative procedure can bring benefits to the investigative course, from the moment that contents are not exclusively treated by an isolated journalist. One of the ideas we mentioned in the previous subchapters is the responsibility of the investigative journalist to use the automated tool to find evidence for his study hypothesis, which falling into the wrong hands can amplify bad journalism. *“In addition to the risk of the generation of incomplete and incorrect news, the algorithms might generate news stories that incur ethical violations, or which disregard the rights of the individuals who are the subjects of the news content. This raises the question of which actors or parties involved in robot journalism bear liability in case of an error on the part of the algorithms that necessitates legal sanctions: the computer company that created the algorithm, the news organization, or the editor involved in editing the news story before it is published on the news website”* (Firat, 2019, p. 3). When we talk about collaboration between newsrooms, we also talk about the possibility of reducing this risk of creating wrong information, to validate investigative journalism processes. However, it is a topic that is little debated and even impertinent because most media outlets want to work exclusively and, in a way, compete in the way they produce information.

One of the examples in which this type of collaboration takes place in a positive way is in the International Consortium of Journalists, where investigations are carried out collaboratively, keeping the identities of the journalists hidden. Automation processes also exist in this group, but the possibility of collaboration with this group is heavily filtered by its stakeholders. Some argue that this is a positive point, some argue that too much suppression of the processes does not bring credibility to the process.

What many authors argue is that there is more profitability and quality in automation processes, when the tools used have already been demonstrated in another project. That is, between producing a tool or a platform from scratch without any kind of external collaboration or using tools and platforms that have already been developed in other newspapers, television, radio, (newsrooms), it is much more beneficial to consider tools that have already been tested. This assumption highlights numerous collaborations made by different entities to apply artificial intelligence processes in the journalistic process. *“Where content is produced through collaboration between journalists and algorithms, they suggest that the human journalist should be credited but that the objects created by the algorithm should be identified”* (Thurman et al., 2019, p. 11).

What underpins this collaborative research and development is what Michel Foucault calls the *Archeology of Knowledge*, which when applied to journalism translates into the effectiveness of action processes through the analysis of what has already been implemented and tested, and which algorithmic processes have significant weight in helping journalists in their work. For this reason, some newsrooms have worked together, with regard to the implementation of artificial intelligence and have reached much more efficient results than if they had worked on this aspect in isolation.

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2.9. What should not be automatized

The big question about what cannot be automated is directly linked to ethical questions regarding the consumption of information produced by computer systems. From our point of view, the first topic concerning this subject is human intuition. *“Replicating human judgment is not an inevitable technological outcome. As it progresses, AI journalism faces the challenge of developing a kind of ‘journalists’ intuition’. This is particularly true, for example, with voice analysis, because humans have a very complex and adaptive way of assessing value adjustments in one another speech”* (Marconi, 2020, p. 62). Bearing in mind that, as has been said before, journalistic work is based on the use of intuition in a practical way and considering the topics developed in the ethics subchapter, in this topic we will develop which are the inherent characteristics of journalism career that can hardly be automated or aided by automation tools. *“Regardless of the changes within the broader journalism media ecology, the demand for journalists to inform the public and hold governments accountable remains strong and investigative is seen as critical to the maintenance of democracy (Bunz, 2009; Knight Commission, 2009). For journalists involved in the making of meaning, computational tools serve to extend and supplement rather than supplant their skills”* (Flew et al., 2012, p. 168). In this context, we can say that artificial intelligence can serve as a support to amplify and improve the skills of journalists instead of thinking that automation methods will abruptly replace certain tasks that the journalist has more difficulty to accomplish.

Intuition plays one of the most imperative roles in journalists work, as when faced with situations that require a rapid response to seek or transmit information, journalists use their intuition, that is, their ability to know what to or not to include in the message to be diffused. This use of intuition is nothing more than the result of experience as a journalist and own knowledge that is linked to emotional response of a given subject based on the history of core memories like the situation. This ability to know, in a fraction of a second, what should be investigated, or what is relevant to report, is based on human instinct which is fundamentally faster than the sum of steps of a robotic system. But the problem is not even in accepting the robotic process, but knowing to what extent these automatic processes are more reliable than human intuition, because we still don't know how to replicate emotion to a computer system in an area where emotion is the keyword, often related to the degree of newsworthiness.

The information production related to processes of emotional filtering of the themes under study, can give us important clues to understand in which stages of the process it is more interesting to place automation, giving space for interpretation for the human mind. Hence, it seems urgent to introduce automation and artificial intelligence to help journalists in this selection of information based on intuition and emotions. *“Computational journalism can enhance user engagement and enable greater interaction with news media through new forms of communication and dissemination including online community and social networking tools, by making available to readers, interactive or participatory multimedia and data visualization tools. Computational journalism provides greater opportunities for collaboration and co-creation between professional journalists, citizen journalists, bloggers, and their various readerships”* (Flew et al., 2012, p. 162). Another important way to validate algorithmic processes is to include them in collaborative relationships between different researchers. As the motto explains, two heads think better than one, we say that two heads and a robot are better

than two heads. This is because it can take the weight of some tasks off the shoulders of human beings and help them to think better together about data. These atomization processes will be very valuable in highlighting tasks that, in fact, do not add value by being automated, we are talking here about “*atomized approaches—recording, recombining, and re-use—that have implications for the way journalists produce news with machines and structure in mind. Importantly, they find “journalists are ‘writing for machines’ by converting unstructured information into structured data to enable automated recombination and future re-use of content”* (Thurman et al., 2019, p. 986). Also, according to Flew et al. (2012, p. 167) the utility of journalism comes when it frees journalists from the low-level work of discovering and obtaining facts, thereby enabling greater focus on the computation, explanation, and communication of news. Many other aspects cannot be automated, not because it is not possible to replicate the process or speed up tasks, but because they do not have the same degree of quality when compared to human execution and this is a turning point in the perception of the man-machine relationship.

“The application of computing to news is not new. For at least half a century, investigative journalists have made use of computers in data analysis (Anderson and Caswell 2019). Harnessing software to select stories for, and present them to, individual audience members also have a decades-long history, with news publishers deploying recommender systems to personalize news since the 1980s, if not before” (Thurman et al., 2019, p. 987).

Therefore, it seems important to emphasize this historical aspect concerning automation. Despite being processed for some years, its effectiveness in a practical context is

not guaranteed and deserves to be perceived from the point of view of the usefulness of these processes in the journalists day-to-day. We can therefore foresee a clear separation of the next careers in the production of automated information. Whatever the machine does better than man will be automated, and whatever man does better than the machine will be the main function. There will also be space for mediators between man and machine and those who monitor robotic processes: *“artificial intelligence tools can generate text directly from data, find hidden insights within video footage, transcribe, and translate in real time, and even create multiple versions of the same story. The adoption of AI in newsrooms also opens new editorial roles, including automation editors, algorithmic accountability reporters, and computational journalists”* (Marconi, 2020, p. 154).

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2.10. Investigative journalism and other genres of investigations

An important aspect to address in this context is that journalistic practice is not a fixed and watertight medium and that it will draw from many methodologies and processes that go beyond the information field. Regarding investigative journalism, this transversality takes on strong contours because the process itself has many points of connection with different areas of investigation.

The word investigation is worth by itself and, therefore, it is not eccentric to assume that investigative journalism process has similarities with other areas of investigation, such as archeology or even historical investigations. Bearing this in mind - that the journalism workflow has points of interaction with other fields outside journalism - we can foresee that our prototype concept can be used by journalists, but also by historians, archaeologists, and other scientific researchers. One of the points of connection between the different fields of investigation is the exploratory workflow itself, which has many similar characteristics in the different areas that we address in this thesis. An important factor in investigative journalism methods is this global perception of the whole story, of the data available about the whole event. Therefore, it will be relevant for these different types of researchers to have a global perception of their research through the interpretation of the visual map of their research. *“For example, long-running, emerging, complex stories that utilize chronologies and timelines as reporting tools need no longer be re-presented in a linear chronological order. Instead, intricate interactive interfaces can be used to focus on time-tagged events, inter-related*

actions, and to turn on or off-key actors or events to navigate and create personalized reconstructions of events” (Flew et al., 2012, p. 162). As we discussed earlier, the possibility of changing data represented on the map (by its temporal arrangement) can also be used to interpret data and its evolution over time.

From the point of view of automation, just as investigative journalism can deal with different topics, even in areas such as History and Archeology, if the topic is addressed in this sense, the *Connect-the-Dots* project is considered useful in its transversality to these different areas of activity. As these different areas have a common characteristic of approaching specific topics in depth, this tool can not only help the journalist's usual process but also sustenance investigative aspects of other areas of investigation. *“Investigative journalists are supposed to be “bolder, morally indignant, less risk-averse, and more willing to confront powerful interests to expose hidden vices and change society for the better” (Lanosga et al. 2017, 266) than journalists from other beats. Their work with sources is also more in-depth, as investigative journalism typically “relies on classified information [...], off the record interviews and meetings [...], usage of covert operations..., and also open data” (Kunert et al., 2022, p. 762).*

This process of extrapolating the research method can be very useful to regulate what is vital to include, taking into account the relevance of data in relation to what is sought to be known. As journalism is a field that works with all kinds of informative matters, it can be an advantage to also understand the investigation processes from other fields of study.

“Although there is disagreement over whether investigation is a suitable term to distinguish investigative journalism from other types of journalism (Aucoin 2005), investigative journalists have often been considered “a breed apart” (Lanosga et al. 2017)” (Kunert et al., 2022, p. 762).

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2.11. Big data and automation

We believe it is essential to understand to what extent the existing databases, at a global level, can be advantageous as elementary repertoire of our system. For the *Connect-the-Dots* prototype idea it is very significant to include the possibility to search data in governmental and non-governmental databases.

“This popular expression [- big data -] refers to the processing of massive quantities of information—government records, genetic sequences, traces left by internet users, etc.—in various domains such as scientific research, public policies, or business” (Parasie, 2015, p. 364).

This kind of tool can bring, in shorter time, data of interest to the ongoing investigation, as well as the possibility of crossing these data reports to different database in order to link evidence that may help the investigation. *“While investigative journalism that involves sorting through tens of thousands of documents looking for anomalies or incriminating evidence rarely produces news with enough appeal or utility value to make it economically viable in the disaggregated media world of the Internet, advances in computing can alter the economic equation by supplementing or even substituting for the slow and expensive human labor required to produce more useful outcomes” (Flew et al., 2012, p. 162).*

This public database analysis will have to be monitored and probably anonymous, providing security and privacy in the process in which the journalist's identity must be

guaranteed. Regarding the identity of the journalist in the context of investigative journalism, he can benefit from anonymity in sensitive investigations that may compromise the journalist's life and security of their family.

“The idea here is that an investment in codes and algorithms that can trawl data rapidly and effectively, particularly where these codes are scalable and open source and can be easily tweaked for re-use, will greatly minimize the time and labor spent on tedious manual scanning and checking thus allowing more time for verification, interviews, and higher value activities. For example, the programming of “set-and-forget” “watchdog” algorithms that continuously monitor datastreams for emerging anomalies or interesting trends may enable news to break faster (Stenger, 2008). By enabling journalists to make sense of complex data more quickly, computational journalism techniques produce datasets that can be easily verified and demonstrated, providing a robust and factual basis for investigative reporting that allows for the development of original stories more quickly and more thoroughly” (Flew et al., 2012, p. 160).

One of the issues related to big data and databases is that they are constantly being updated, so our system will have to make room for these updates. We believe that access to public databases will be for the purpose of searching - where specific data for the investigation is a document that confirms a suspicion, an entry into a building and the metadata of the associates or a photograph of the road space to identify a vehicle. *“In the coming age characterized by the introduction of micro data collecting sensors embedded everywhere – in our clothing and all the gadgets that surround us – human journalists will find it hard to*

compete in this ecosystem of automatic comprehensive data collection and writing” (Latar, 2015, p. 5).

Automation and robotics have entered our lives in an overwhelming way. Everything is possible, everything is replicable, all scenarios can be realized in the virtual world. *“Instead of seeing the database as encapsulating the truth, the journalists considered it rather as a fragile construction that needed ongoing adjustments to get it to correspond to the “real-life evidence” collected on the ground” (Parasie, 2015, p. 372).* However, investigative journalism seems to be drinking little of the available potentials, largely as a matter of work ethic and the development of the journalist's critical thinking. For Jonathan Stray, artificial intelligence has given the possibility of having a significant advantage in the analysis and interpretation of data that serves as a basis for investigative journalism. It then becomes natural to review the point at which robotics and artificial intelligence significantly change the work and usual workflow of investigative journalists – *“algorithms enable the discovery of new social, health, economic and ecological trends at the budding stage. The process of analyzing data stored in data silos employing AI algorithms is called “data mining”” (Latar, 2015, p. 5).*

We can state quite clearly that language analysis and document classification have been the most useful tools for the investigative journalist from the point of view of linguistic analysis and generation of information, such as classification of data for its best use in the investigative procedure. We consider automatic lead generation to be a great advance, which we often find on the home pages of major information sites (Stray). From this same point of view, countless other ethical questions arise about the use of these tools and their applicability, when we are faced with limitations that evoke disinformation.

In this context Konstantin Dorr discusses the issue of ethics and urgency of algorithmic journalism, that is, all the journalist procedures that can be translated in machines and

computers. It is not a question of distinguishing whether algorithmic work has value or credibility but observing to what extent the community of journalists and information consumers accept that a computer or machine can help journalistic performance. *“First, there is the vastly increased amount of data that is publicly available, particularly information from government sources: regardless of whether that data is released through official outlets or “underground” channels such as WikiLeaks”* (Flew et al., 2012, p. 160).

To what extent can we empower machine critical "thinking"? This is one example of what Neil Thurman addresses in his work, not from a strictly technological point of view, but from the need and relevance of a quality public service that can face different political ideologies that proliferate values that permeate beliefs and political diversity. *“All forms of human activity are being digitized and stored in data silos. All media content, the context of the content absorption, and the consumer engagement are digitized and automatically tagged by artificial intelligence algorithms (Lemelshtrich Latar & Nordfors, 2009)”* (Latar, 2015, p. 5). Values that integrate what it is to be human, what it means to live in a community and respect structuring rules and laws and to what extent equality between human beings is preserved. Will a semi-automated platform be able to emphasize these journalistic values and empower journalists with tools that help build truth and justice on planet Earth?

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2.12. State of art investigative journalism companies

“The International Consortium of Investigative Journalists (ICIJ) uses an AI-powered tool to automatically recognize and index text documents. This smart software is used by ICIJ reporters to make sense of 13.4 million confidential documents relating to offshore investments, an effort that eventually became an influential journalistic series – ‘Paradise Papers: Secrets of the Global Elite’” (Marconi, 2020, p. 62). In our study, it is important to highlight journalistic corporations that focus on investigative journalism. One of them is the ICIJ, which has been working mainly in the study of sensitive cases within the scope of investigative journalism in an autonomous and anonymous way.

Another well-known organization that focuses on investigative journalism topics is the Wikileaks platform - WikiLeaks (www.wikileaks.org) is an international organization that publishes anonymously submitted document submissions and leaks otherwise unavailable to the public. *“WikiLeaks founder Julian Assange has referred to a new kind of “scientific journalism”, where readers can view primary source data alongside news stories so they can verify for themselves the accuracy of the interpretation in light of the factual information available”* (Flew et al., 2012, p. 163). WikiLeaks founder Julian Assange has referred to a new kind of “scientific journalism”, where readers can view primary source data alongside news stories so they can verify for themselves the accuracy of the interpretation considering the factual information available.

We also consider it pertinent to highlight the work of the National Geographic company about the development of investigative journalism in different areas of activity. In the same field of action, we emphasize the role of the Google Digital News Initiative, which has been investing in different research projects that focus on topics such as investigative journalism and the use of robotics and automation. *“Programs such as Google's Living Stories (<http://livingstories.googlelabs.com/>) allow readers to use software tools to personalize their news, collating all versions of a news item into one article, and continually updating that article, while also providing interactive timelines on the news item”* (Flew et al., 2012, p. 162).

The ICFJ regularly makes an annual state of technology in global newsrooms. These studies are vital to emphasize this analysis of the existing tools and why shall be continued and strengthened. By doing this, we reduce the chance of reproducing something already developed.

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2.13. Platforms and tools similar to **CTD** (**Connect-the-Dots**)

For the investigation to be carried out, and to obtain the necessary results applied to the present reality, we specified that it would be significant to analyze tools that have already been created within investigative journalism scope. In this logic, it will be foremost to draw a portfolio of the tools that are useful for the investigative journalist. *“Rather, AI more narrowly refers to a branch of computer science focused on simulating human intelligence, one that has recently been especially engaged in the subfield of machine learning: the training of a machine to learn from data, recognize patterns, and make subsequent judgments, with little to no human intervention”* (Quarterly, 2019, p. 673). Understanding the state of the art of investigative journalism platforms today and by recognizing projects and tools already made, it is possible to predict, more exactly, what is going to be made and what can be customized, when we talk about free-source code. It is also critical to analyze what was made so far and understand what the main requirements are. Some articles refer to platforms as already existing tools in newsrooms, as Bradshaw refers to his blog, on existing dashboards that help journalists.

It is essential to consider platforms that place together several characteristics to help journalists in their work, such as platforms that have already been built within the sphere of journalism. *“CND systems can also help monitor data sources such as numerical data streams or textual documents and identify items of interest to be brought to the attention of journalists. For instance, the BBC's Data Stringer prototype was developed to monitor data streams and*

trigger alerts when rules relating to trends or outliers were matched (Shearer, Simon, and Geiger 2014)” (Diakopoulos, 2020, p. 948).

These platforms are usually associated with media groups or journalists' associations, as is the specific case of 'Datashare' platform developed by the consortium of journalists ICIJ, 'Conta-me Histórias' developed at INESC TEC and 'Algorithmic Science News' developed at University of Porto Media Innovation Labs. It is also crucial to highlight the potentialities of data mining and Document Cloud, in ways that they help to understand the processes behind analyzing and sorting of data. In what concerns to Document Cloud, this platform is a strong reference to our investigation since it gives the opportunity to journalists to discover specific data in documents. This platform is accessible online and can be used by journalists and other professionals who need to find information in big data. The Document Cloud platform fits the concept of data mining, and this same concept is the core idea behind the system we aim to develop. We believe that because data mining gives us the possibility to run through data and by various systematic processes, it can give us resulting data more appropriate to the journalistic needs. The processes inherent to the Document Cloud platform and the techniques used to automate processes could be exemplary for our study.

Henceforward, we must recognize the level of innovation in media companies and the closeness of these tools to the investigative journalist profile. Many methods can be recycled and incorporated into our project. Data journalists, web developers and interactive designers, currently employed in the world-leading digital newsrooms, tend to subscribe to an altruistic ethos not unlike the one shared by open-source software movement. First, we highlight the role of the “Beam” project - *“Beam system is designed to enable the remote presence of a human journalist at an event, i.e. without being physically there”* (Latar, 2015, p. 8). In the same application spectrum, we identified the Double tool - *“Double is the ultimate tool for*

telecommuting. Double is a remotely controlled mobile teleconferencing system, enabling conversations to happen anywhere and anytime" (doublerobotics.com). Another telepresence robot manufacturer is Anybots, which enables an avatar to represent the journalist: "Short of being face-to-face, Anybots, Inc. offers the most interactive forms of communication available today by providing the user with a personal remote avatar. With Anybots you can instantly be immersed in a distant environment experiencing the forefront of a new class of communication called mobile telepresence, allowing you to never miss an important event, meeting, or experience again" (anybots.com) (Latar, 2015, p. 8). Regarding algorithmic processes, we highlight Quill – “the Quill algorithm operates in three stages: data reception, extraction of key facts and insights from the data employing AI algorithms and transforming these facts and insights into readable stories without human involvement” (Latar, 2015, p. 9), as well as the Automated “Insights algorithm [that] enables the writing of stories in any desired journalistic format: summaries, bullets or long-form articles. Its real-time stories can be published on any scale in multiple formats – emails, mobile applications and all types of social media” (Latar, 2015, p. 9).

Regarding the projects developed in automation in scientific narratives we identify the AINC: “a major competitor of Narrative Science in the automatic conversion of data to journalistic stories is Automated Insights of North Carolina. The Automated Insights slogan is “We Give Data a Voice.” In 2014, the Associated Press publishers started testing simple algorithms from software provided by Automated Insights in Durham, North Carolina, which generated earnings reports on listed companies. This software is used to generate news assuring the continuity of news operations by increasing efficiency with automation of certain editorial tasks, which are more time-consuming and laborious (Marconi and Siegman, 2017, p.16). In the same area “the quartz AI Studio is designed to help journalists use machine-

learning methods to develop new types of stories. One of those projects is Quackbot, among whose skills is that “given a topic, it can suggest some reliable sources of data” (Marconi, 2020, p. 138).

“A final factor that impacts the flow of attention towards leads is the nature of the user interface (UI) and how it frames information for users. Some systems, such as Newsworthy or Tech & Check, send discrete chunks of information via email” (Diakopoulos, 2020, p. 955). In the same perspective of approach to news content, we identified Automated Insights, Narrative Science, Arria, and Yseop, among others (Marconi, 2020, p. 87).

Regarding the creation of visual maps to help in the investigation process, we highlight Jigsaw and *“Wibbitz [that is responsible to] recognize visual elements in photos and videos and automatically [and] match them in photos and videos and automatically match them with a text script that has been previously generated through natural language processing” (Marconi, 2020, p. 115).*

At this point, we have mentioned some tools and platforms, directly and indirectly, related to the platform that we intend to design. We also brought to discussion the notion that data-driven journalist is not entirely reliant on a whistleblower action, or files, since these data can be found in illegal containers that describe the principles of deep web.

This premise will have to be confirmed and extended, by testing real cases and combining these same cases with a non-functional prototype, that will give us important clues about what should be included and what should be omitted from the initial design. It is also crucial to identify specific projects that are directly connected with our research hypothesis, as is the case of timelines and infographics that help the investigative process.

The use of dashboards in newsrooms is not new, so the analysis of pre-existing tools in this scope will allow to frame the *CTD* project in scientific research and media innovation.

Regarding platforms, more specifically dashboards used in newsrooms, it is critical to recognize what has already been created to obtain a more accurate perception of the developed knowledge and the application of this knowledge in real contexts. Within the types of dashboards that help the journalist in the usual procedure of creating news we identify Tweetdeck and Netvibes. The ScribbleLive platform, launched in 2008 by two employees of Canadian television network, Michael de Monte and Jonathan Keebler, focus its purpose in real time storytelling. Among its clients we can list Reuters, MSN, CBS and CNN. This platform allows journalists to cover events in real time using their own content or user generated content. There is also the possibility for journalists to publish their content directly through the computer and mobile phone, with the possibility of editing this content in real-time (Guerrini, 2013, p. 16).

The Overview tool offers the ability to cluster documents and view those clusters. This platform allows the custom creation of visual data, providing a lot more flexibility and adaptability to the needs of different kinds of investigations. DocumentCloud project serves as a repository for collecting and annotating documents. The documents become a substrate for investigative journalism work that can be built upon using the API.

The *CTD* platform presents itself as a set of tools that articulate each other in order to reduce the time spent on more demanding tasks of the investigative journalistic process, as well as to support the completion of more complex tasks, through the use of digital automation tools. In terms of the philosophy of tool, it is important to emphasize the main objective of the project, which consists in the development of a tool that allows media innovation and reinsertion of the role of the investigative reporting in society.

One of the most important processes in the journalist's work is to apply his knowledge, research, conduct and fieldwork so that this information reaches the target audience. The

writing process is one of the most sensitive, but also more transformative in the life of a journalist. The purpose of a journalist is to use its ability to analyze and interpret events and create narratives capable of informing and explaining a subject, allowing information access to all. Finally, we highlight the role of the Journalist Studio platform (<https://journaliststudio.google.com/>) developed by Google as a significant example for the implementation of different tools for journalists to use in research contexts – a semi-automated platform.

PART II

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Methodology and methodological instruments

Chapter 3. Methodology and Case-Study

Chapter 3. Methodology and Case-Study

3.1. Design-based research methodology

“Design-based research methods are a thirty-year old tradition from the learning sciences that have been taken up in many domains as a way to study designed interventions that challenge the traditional relationship between research and design” (Hoadley & Campos, 2022, p. 215).

The methodology relating to research-based design is a precise and relevant methodology that we must selectively apply to our study for the simple fact that the essence of our research is based on a scientific experiment that intends to be validated in a real context. Despite being a methodology with few years of empirical experimentation, the idea arose to use it as a form of scientific validation due to its structuring nature of empirical knowledge combined with its introduction of knowledge structures. We identified the growing need to incorporate automated processes in the investigative journalism process as the basic problematic of our investigation. Juuti and Lavonen (2012) believe that design based on research is one major way of findings of evaluations, *“through these testing phases, designers attempt to manage uncovered needs and decide on objectives to refine the artefact after testing”* (Juuti & Lavonen, 2012, p. 61). Taking into account the scientific and empirical developments in the performance of automated systems, it is crucial to integrate this type of solutions in projects that allow the improvement of investigative journalism. *“For example, participatory action research—a qualitative approach akin to design-based research—involves*

collaboration between researchers and participants, local practices that support systematic theorizing, and improvement in both theory and practice. (...) Likewise, intervention design—sometimes equated with formative evaluation—is often undertaken to generate evidence used to guide possible revisions in an ongoing design (Reeves & Hedberg, 2003)” (Wang & Hannafin, 2005, p. 6).

When we talk about intervention design, we are thinking about developing an idea and applying this same idea to solve a problem we face in our daily-lives. *Connect-the-Dots* is an idea, a concept that became a project of helping investigative journalist to achieve better results in their work, and given the fact that investigative journalism represents the 4th estate, much more credibility and faith must be given to the processes of automation that can be fused with the standard workflow in investigative journalism.

In theoretical terms, we speak of design-based research as an intermediary practice used by researchers concerned with applying scientific knowledge in real contexts. This method is known to be a method with little experience or little effective applicability in research contexts and is, therefore, a relatively recent practice within the scientific community. This method has two basic aspects of application: the first aimed at realizing what type of changes in the process of creating a design are necessary to carry out in investigation, and the second aspect is concerned with determining the theoretical bases and implications that the experimental process has for the construction of scientific theories. Due to the fact that this methodology encompasses these two concerns, it is widely used in research of an educational nature, insofar as, in addition to allowing us to understand what types of projects can be integrated in real life, to what extent these same research projects incite content theories that can be permeated both in the scientific community and in the educational system. *“This synergy engenders simultaneous refinements of theory and practice as theory is generated and refined through its*

application; in effect, educational approaches and theory emerge reciprocally (Bell et al., 2004). Synergy helps to generate principles that inform the design itself as well as the thinking and actions of researchers, designers, and practitioners” (Wang & Hannafin, 2005, p. 13).

With regard to the application of this methodology to the *Connect-the-Dots* research and prototype project, we determined that the scientific assumptions and knowledge, already put in place by the scientists and researchers who addressed this issue, could be decisive in building an ideological and also practical tool for the conceptual advancement of investigative journalism and the creation of contents in this field in different methods of communication at a global level. Although the idea of building a timeline to support research emerged in a practical context of ethnography and participatory observation on Portuguese public television, other tools and platforms had already been identified as potential methods to improve the quality and production of investigative journalism. The data collected both at the level of scientific knowledge through the analysis of projects and investigations published in scientific journals allowed concluding what type of methodology would be more relevant for the execution of this work. It was therefore significant for us to define a methodology that would allow room for error, for trial and improvement, through the analysis and interpretation of the iterations that were carried out within the scope of this project.

When we talk about methodologies allied to the standard prototype concept design process, we talk about their study and possible integration in a real context, and we also talk about consecutive tests in a conceptual way, in which the reflections of the processes can be integrated into the structures of thought. *“The goal of these researchers/educators/designers moves beyond offering explanations of, to designing interventions for. In fact, and consistent with pragmatists such as Dewey, Pierce, and James, to some degree it is the latter functional constraint that constitutes what is a useful explanation” (Barab & Squire, 2004, p. 9), therefore*

we are talking about procedures who allow building of solutions for technological advancement and also the evolution of critical thinking.

In the case of *Connect-the-Dots*, the extrapolation process contributed to the development of a tool that suggests being a solution to a real problem in investigative journalism. For this investigation, we outlined that there will be some moments of iteration in which we could assess the pertinence of the investigation that we carry out in this direction in order to design a tool that allows the evolution of investigative journalism in the current context.

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3.2. Design-based-research process

As Hoadley (2004, p. 203) believes design-based-research methods can only be helpful if they ensure that research methods can test the relevance of a design or product and therefore gives scientific and pragmatic feedback. The design-based inquiry process presumes two types of analysis. The first presupposes an approach of testing, which means that the extrapolations made during the investigation can be changed depending on the intermediate results. Since *“design-based research is also characterized by an iterative cycle of design, enactment or implementation, analysis, and redesign”* (Wang & Hannafin, 2005, p. 9), in practice, the design can be readjusted by the final consumer, but for this to be effective, some iterations will have to be made to conceptually test the idea through its introduction to final consumers. We have come to four initial questions and hypothesis we want to validate and understand if they can be applied in today society, and this is a major core of our investigation and project:

Q1. How can a journalism support platform, based on automated tools and artificial intelligence structure, leverage the efficiency and the outcome of investigative reporting projects?

Q2. How can data visualization and data journalism be applied as tools to help investigative journalists?

Q3. How can an assistant help journalists increase cognitive efficiency?

Q4. How can artificial intelligence help in the thinking process required in investigative journalism?

It is interesting that it makes it possible to make intermediate measurements for the scientific structure depending on the in-between results, and thus be able to test the research process and anticipate errors. We envisioned that *Connect-the-Dots* would be a project capable of interpreting journalism reality and conclude how artificial intelligence can be an influential method of achieving more results in the investigative reporting and to draw conceptual conclusions than can actually change the digital era paradigm.

In the first steps of this project, we were focused on understanding how journalism evolved over the years, the major differences between regular journalism and investigative journalism and how robotics and artificial intelligence emerged in our society and integrated our ways of producing content and structuring the news system. We did this research on the state of art of this theme because we have identified a problem and understood that somehow AI and automation can become the solution of these problems, and this way of thinking was brought from the increasing use of digital tools in our daily lives.

We have today the needed tools and knowledge to solve these same problems and scientist and designers can draw a solution to these same problems by understanding the real needs of the journalists and propose the solution for these same problems. So, after we understood the basic fundament ion about the scientific areas we want to achieve, we have made an ethnographic experience in the Portuguese public tv station in order to identify the

requirements needed, or the problems journalists faced, that automation and artificial intelligence can actually improve.

After we identified those problems and the requirements adjusted to this realization of needs, we have drawn the first version of the prototype idea that could help investigative journalists on their research methods. After doing these first draft we realized that we needed further investigation on major themes of this project, so we have focused on understanding how machine learning could be helpful on drawing a better tool. We have also analyzed data collected on participatory observation and on data from interviews and surveys and we understood the best solutions for the problem given some inspirational tools that will be used in an advanced version of the prototype concept.

After we envision the second version of *Connect-the-Dots*, we are going to implement this solution with a broader group of participants, including international investigative journalist, who will remotely test this platform and we are going to measure their acceptance and involvement with the platform in order to create content. By interviews, surveys and usability tests we could accomplish great results, by understanding how the tool is realistically interesting for these group of journalists, scientists and researchers.

After we analyses this usability tests and the answers given in interviews and surveys, we can identify the implications for theory given the experiences we have made as researchers with this group, we can draw hypothetical conclusion that can help to change digital paradigm and can also understand which mistakes and main changes we have to apply to the design in order to have more interesting results.

As we planned in advance, we are going to present a high-fidelity prototype and the implementation of this high-fidelity prototype will be made in a future situation where we can

develop a back-end solution, but for this project we will stop on the implications for theory of the usability tests, and draw theoretical conclusion on these processes.

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3.3. DBR - focus the problem

Many authors agree that, even though design-based research is not a well-established technique it has become one methodology chosen in specific scenarios because it has the possibility of “*intertwine with the goals of real-world practice in this kind of work*” (Joseph, 2004, p. 236). In the case of the ongoing investigation, the problematic focus lies on the most vehement needs in the practice of investigative journalism. It was from our ethnographic experience in the studios of *Centro de Produção Norte* de RTP that we were able to identify the most vehement problems of investigative journalists as well as their desires to solve concrete problems in the production of investigative journalism content. If we consider the ethnographic experience carried out at the CPN as a way of introducing new concepts about the production of journalism in the Portuguese context, we can conclude that the results obtained in the analysis of the data collected in this ethnographic experience may be preponderant to have a deeper perception of the phenomenon concerning the integration of artificial intelligence in investigative journalism newsrooms.

“Design-based research approaches research in education by using intervention to provide insight into learning in real-world contexts” (Joseph, 2004, p. 236).

Later on, we will analyse in more detail the numbers associated with our data collection, where we can more accurately observe the data related to the construction of

hypotheses. We can emphasize that the key problem under study is the acceptance of artificial intelligence as a source of help for journalists, and to understand in which ways journalists need to automate certain tasks in order to have more time to focus on the investigation itself. We believe that the data collected and the knowledge that was developed throughout the investigation could have replicable results that could go beyond the mere scientific context. *“One of the central ideas in the scientific paradigm is replicability; however, because design-based researchers cannot (and may not want to) manipulate cultural contexts, it becomes difficult to replicate others’ findings (Hoadley, 2002)”* (Barab & Squire, 2004, p. 8).

Therefore, the problem in this investigation is to understand the acceptance of journalism regarding artificial intelligence and to understand which tasks related to the journalist's usual workflow can be automated in order to improve the quality of work. We also identified as a problem to be evaluated, related to global health and the perception of journalists regarding their own health from the use of robotics and automatic systems to support journalistic production.

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3.3. DBR - understand the problem

“DBR attempts to understand the world by trying to change it, making it an interventionist research method. However, DBR problematizes the designed nature of interventions, recognizing that the intended design is different from what may be enacted in a complex social context, one in which both participants and designer-researchers have agency” (Hoadley & Campos, 2022, p. 211).

After realizing the reality of portuguese journalism within newsrooms, we were able to realize that there are certain basic requirements that arise from the purification of data collection carried out in the context of research. These requirements arise from the practice of participant observation, the practice of ethnography, the application of surveys and the analysis of data collected in the interviews carried out within the scope of this investigation. But you can talk about a first phase of introducing automated machine-learning processes, of analyzing information in a database. By using DBR methodology we can understand that the problem regarding the acceptance of artificial intelligence by journalists it is far more complex than just the idea of using or having help of a robot in the process of investigation, we unveil other problems facing the deliberate use of robotics and automation in processes of cognition and intuition over the data analysis. *“Professionals like instructional designers or teachers must align known patterns and psychological findings with the particulars of the context and individual learners. Although design research typically applies to the gathering of information*

that feeds into a creative process of design, design itself creates knowledge.” (Hoadley & Campos, 2022, p. 210). We have experienced that the problem identified in this investigation needs specific development of machine learning to achieve its maximum potential. We identified specific needs that can be automated in order to reduce stress or extensive workload from investigative journalism. The problem also lies in the fact that investigative journalism has low financing by media corporations because each investigation might need an extended period to reach the expected results.

When we think about the role of investigative journalism as the fourth estate or the fourth power, we can understand that society needs this type of journalism to restore balance and justice in society, but it can get very difficult for these journalists to finance their projects, so this type of journalism has been falling throughout the years. With the introduction of a semi-automated platform that promises to substantially reduce the time spent on the most tedious tasks, investigative journalism can condense the time needed to have results and it could be easier to be financed by media groups.

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3.4. DBR - define goals

The main goals of this investigation are, in a first stage, the investigation of a topic in a conceptual way and the reality studied, to understand current investigative journalism and its weaknesses and strengths and what is the role of artificial intelligence and automation in improving journalism. It will be in the collection of strategic data from professionals in the field that it will be possible to measure more precisely the needs for application to real context. *“This analysis led to its two major theoretical goals—(a) observational investigations and (b) theory articulation—which are supported by all design efforts, ranging from determining the characteristics of inquiry products, through selecting investigation strategies, to designing tools and artefacts (Reiser et al.)”* (Wang & Hannafin, 2005, p. 9).

The two main goals of this investigation are to recognize what kind of requirements are necessary to solve the previously identified problem and to know to what extent the application of the solution to these problems can constitute a solid base for the scientific advance in the area. Therefore, one of the first goals is to create solutions that can suppress the problem that we identified in the first iteration with RTP journalists, and then test these solutions with a restricted and defined group to assess the extent to which the solutions presented are relevant in work contexts. After checking the relevance of the design of these solutions and testing them with investigative journalists, it may be necessary to make adjustments to meet the needs of the second iteration. When applying these tests in the case study selected for this project, it will be easier to make implications for the theory related to artificial intelligence in investigative journalism. This means realizing to what extent the design we developed to address the problem

is capable of structurally transforming the way in which investigative journalism is produced in the field and, therefore, assessing the scientific conclusions we grasped, which can significantly change the way we understand conceptually investigative journalism in the digital landscape.

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3.5. DBR - conceive the outline of a solution

Our aim with this project is to be able to devise a real solution to the needs of investigative journalists. These needs, as previously mentioned, were gathered in the scope of participant observation, in the implementation of the first iteration. Therefore, the final expression of the solution to the identified problem will be the creation of a prototype idea capable of assembling a primary expression of the tools needed to help investigative journalists both in the writing context and in the fieldwork context. *“Prototypically, design experiments entail both “engineering” particular forms of learning and systematically studying those forms of learning within the context defined by the means of supporting them. This designed context is subject to test and revision, and the successive iterations that result play a role similar to that of systematic variation in experiment”* (Barab & Squire, 2004, p. 2). It was during our ethnographic participation at the research center that we began to extrapolate the information collected in the ethnographic process carried out at the North Production Centre of RTP. It was during the ethnographic experience at the RTP innovation center that we developed the first idea and draft of the *Connect-the-Dots* prototype concept. When we built the first version of the prototype idea, which was based on the work structure of RTP's investigative journalists, which later had an update, regarding the functionality and tools to be integrated for the investigation process.

Taking into account that *“objective from the research point of view is not just to produce an artefact, but construct knowledge of science teaching and learning through designing actions”* (Juuti & Lavonen, 2012, p. 62) we believe that the development of the design of the

prototype idea and its validation through usability tests can be critical sources of knowledge construction that can also be applied in a practical way in the environments studied.

Chapter 4. Perception and action - flow and dynamics of the radio and television journalistic method in the digital age: participatory observation

Chapter 4. Perception and action - flow and dynamics of the radio and television journalistic method in the digital age: participatory observation

4.1. Portuguese public broadcast

“Participatory research is a dialogue over time and a mobilization of human resources for information gathering that may lead to action” (Couto, 1987, p. 85).

We believe that the best way to scientifically validate a hypothesis about the current state of science in digital media is to understand the reality of journalism within newsrooms, which is why it was our intention from the beginning to examine the practices of journalism during its application in the field and we chose the portuguese company public television, because we believe that their working methods are reliable and replicable, since we are talking about a tv station which has more than 60 years of existence. Within the participant observation method, we use several ways of measuring the reality studied, taking into account our study focus. In this chapter we will spotlight essentially on direct observation to assess the workflow of the current journalists and the investigative journalists, as well as the digital tools used in the context of newsrooms and in the context of field reporting, to integrate digital platforms into the conventional process of making news. It should be recognized that in addition to recording the ethnographic experience in a logbook, we also used the method of visual ethnography to capture key moments in the news production environments, taking the opportunity to draw conclusions about the behavior of journalists considering that they were being studied, for the construction of a prototype concept to support your activity. Couto

believes that “*participatory research is related to power and power is related to change or to maintenance of the status quo. It borrows heavily from Marx and contemporary social theorists such as Paulo Freire and incorporates class analysis. Its central concerns are research, knowledge production, and empowerment related to the position of oppressed people, poor people, people with political or economic disadvantage*” (Couto, 1987, p. 84). So, it is our belief system that we integrate in our study environments that are replicable from the point of view that they are an example of conduct inside the journalist idea.

What is participatory observation and why is it important in digital media?

Participated observation is a method that allows, in substance, the immersion of the researcher in the environment to be studied. The researcher becomes part of the community, through the validation of the researcher integration, and once the researcher is accepted by the community being investigated, the researcher can use proximity to achieve more reliable results. This possibility of being closer to our object of study allows us to know some particularities that otherwise would not be possible to identify, which makes the content studied richer in the way we integrate these small details in the system design. “*One of the key assumptions of participatory research is that it will lead to change by the people who do research. Advocates thus distinguish participatory research from other research which assumes that change will come, if it comes about at all, by the action of people who read the work of others. The participatory research adherents eschew that hope for the intention of mobilizing people, especially those affected by the problem under study, in the process of doing the research. Research and action thus form a continuum and are part of a single process of political change*” (Couto, 1987, p. 84). When we talk about investigative development at the

level of digital media, it becomes even more crucial to go back to observing the world from an analog point of view and to experience the involvement of producing news, taking into account human flaws within a news production system. The participatory observation can be the bridge to reach more reliable conclusions about the needs of the journalist as a human being and how artificial intelligence and automation are able to reduce these needs.

In what way does the observation participated in RTP allow us to draw conclusions about the journalist's Workflow?

As Couto concludes the process of observation in the field of science must follow questions like *“how do we go about getting **this information**? Who is going to get the information? What does the information mean? Is it enough information? How do we interpret the information? What action seems reasonable in the light of what we have learned?”* (Couto, 1987, p. 85). These same questions are capable of leading the researcher through the immensity of data that he has to analyze. One of the important characteristics of this experience was the fact that it was possible for us to inspect the newsroom routines from a very close point of view, as if we were experiencing being part of the news production team, being able to feel the routines and tasks to be performed within the stipulated times for journalists. Since *“the participatory research process is a learning process for all involved, not a process whereby some people accumulate information about other people”* (Couto, 1987, p. 85) our proximity to the company's routines meant that we could clearly understand the steps taken by journalists from the moment they know they are going to make a news story until the moment they actually publish the news article. Although this form of news production changes depending on the media, we can say that there is a conceptual thread in the way news is produced.

What kind of conclusions can be drawn from the practice of visual ethnography?

“The first empirical studies applying ethnographic fieldwork to the Internet were conducted by scholars from different backgrounds mostly from communication and media studies and were based on triggering metaphors that led to a conceptualization of the Internet as a new kind of social space” (Ardevol & Cruz, 2013, p. 3). Within this way of seeing the world, sometimes the usual methodological techniques applied in science cannot give the transparency necessary to study a social group. In this way we chose visual ethnography as a way of knowing in depth our group of study.

Regarding the practice of visual ethnography, we can say that the journalists themselves were warned about the recording of images during the experience, some preferred not to be photographed or recorded, especially in the radio newsroom, but most professionals enjoyed to know that they were experienced to be documented.

Many journalists tried to help this experience, showing us places of interest, or interacting with us during the reports, especially on the radio where they narrated the procedure they were doing. We believe that the results of visual ethnography will be able to give us extra fundamental information, to complement the data collected by other methods of participatory observation. *“Observation has the potential to reveal the mundane, routine activities that collectively make up those practices of everyday life that may escape the discursive attention of participants”* (Clark et al., 2009, p. 348). The language of photographs and documentary videos can be crucial to understand particularities of the routine within the newsroom and to take measurements on the relationship between journalists and their own profession.

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4.2. Radio newsroom workflow

As “*observation may permit the documenting of the life worlds of individuals who are unable to express their lived experiences verbally*” (Clark et al., 2009, p. 348) the radio experience was fundamentally transformative as we perceive the methods of investigating news, using hybrid tools, both from a digital as an analogue point of view. In radio, there is a greater proximity to the accuracy of the news making the emphasis of all news production go through creating credible information that is capable of being auditory stimulating. The radio experience differed in the first week from the remaining weeks due to the absence of the communication director in the newsroom. We can say that the experience of analyzing the radio processes was fundamental to understanding all the production of news at a global level within the RTP universe. To register all the ideas and hypotheses founded in this experience we have created a notebook capable of containing all the findings we got across this experience. We believe that “*field notes and field diaries are essential to ethnographic research. Traditional field notes, tables, and drawings are handwritten, and some online ethnographers still employ this method in addition to the multiple forms of capturing and registering information as audio and video records, printouts, screen captures, navigation videos or social bookmarking, and the visualizing social network software available to us today*” (Ardevol & Cruz, 2013, p. 15).

Radio goals

One of the first goals outlined for the experience in the radio newsroom at RTP was to understand what the essence of radio magic is and how it is effective in a radio studio. It was our intention to understand how the daily news alignment arises, what types of tools are used by journalists to do the work entrusted to them and how they express their work to the community.

Investigative journalism on radio

As far as investigative journalism on radio is concerned, this was mainly achieved through the work of Eduarda Maio, a journalist who worked for several years in television, and who preferred to return to the medium of radio. The “*Ponto de Partida*” is a weekly radio program that focuses on a specific topic that Eduarda investigates from her point of view as an experienced journalist. The results are detailed reports that unfold through the magic of sound and the interpretation of the clues that Eduarda puts in her pieces. Investigative journalism, in this sense, is explored from a more creative point of view, giving particular focus to the sound experience, and how it makes us feel in relation to a given topic. We can say that the experience of investigative journalism on radio is like a journey within a subject, in which the journalist is the helm of the entire experience.

Radio work methods

Radio work methods can be separated into four broad categories. The first, and most interesting for this investigation, is related to investigative journalism, in which we can say that

it is a journalism that isolates itself more from others, since it is a work that needs more focus and attention, so we verify that it is an independent work from all the others, mainly due to the fact that we do not have a strong commitment to the day-to-day events. We found that in relation to investigative journalism there is a elementary theme that is the basis of investigation, then is the journalist's work to learn about all the particularities of the subject and then access to experts, people who will interrogate in order to have soundbites, that is, the sound excerpts of interest to complement the final audio piece. As far as current journalism is concerned, it starts with the distribution of tasks at the beginning of the day, and depending on the distribution, each journalist will focus on a certain topic. It is also worth noting that some journalists in the newsroom are responsible for producing and giving voice to the news, which on the radio are short and objective and are repeated more often throughout the day.

Software used

From our experience in participatory observation, we can say that the software most used by radio journalists is ENPS to verify and explore the news released by the main world communication agencies - a service paid by RTP to which all journalists have access, and the Dalet Plus, software used to assemble the radio parts. Each software is used on a daily basis, and each has specific tools designed for the journalist's best role. It should be noted that all files created by journalists on a daily basis are accessible in a database that can be edited by journalists from the North and Lisbon offices.

Participated observation radio results

Since “*field notes help researchers catalog, describe, and develop theories from their observations, as well as record their emotional reactions and impressions*” (Ardevol & Cruz, 2013, p. 15) we came to a conclusion, analyzing our logbook, that one of the first lessons learned in the field of radio is that there is a greater rush to develop content since the news is repeated in a shorter fraction of time, as for instance in the television newsroom. One of the main concerns of radio journalists is their voice projection and accuracy in their words. We can also say that on the radio there is more space to express more intellectual, more interesting and in-depth points of view on a particular piece, attesting here to a more mature value to the journalist who transmits the information. In the context of writing, there is also more sobriety and calm in daily routines, paying more attention to a good location of the portuguese language. Here the message has an intrinsic value in itself as a way of informing through the expression of the medium.

Investigative journalist workflow

Here we can draw a parallel between investigative journalism and current radio journalism. Firstly, we identified that the execution and preparation time of current journalism is substantially shorter than that of investigative journalism. Firstly, because current journalism topics are fleeting and are based on daily expression, while investigative journalism can extend over several weeks or months, being a longer process in time. While current journalism deals with one or two concepts, investigative journalism crosses several concepts to interpret a specific scenario. When we talk about investigative journalism, we are not just talking about criminal investigation journalism, but also about historical and scientific exploration, in which a specific topic will be explored, in a more oriented, more specialized way on a cut of a topic

that is wanted to explore in detail. As far as investigative journalism is concerned, it deals with more subjects, with a greater volume of information, and is expressed in an informative piece lasting about an hour and is repeated weekly.

Newsworthiness criteria

We believe that the newsworthiness criteria in RTP's radio newsroom have many similarities with the newsworthiness criteria for RTP's television newsroom. But what we thought was more relevant to address is the proximity of events in geographical terms, taking into account that they have some elementary newsworthiness, such as being an event with someone famous, or a representative in power, death or catastrophe, cultural events and especially exclusive to interviews they do in the radio's northern production newsroom.

Writing routines

Since “documentary filmmaking requires additional (filmmaking) skills, moving images created in the field are still predominantly used as data for analysis and as parts of research findings or methods presented in lectures, seminars and academic conferences” (Rakic & Chambers, 2010, p. 262) we understood that the best way to capture the essence of the radio routines would be to record some videos about the daily-basis tasks, in order to have a closer insight that could be re-watched in the future. By doing that we learned that the main newsroom routine is to understand which news has already been published in most printed newspapers. There is also a connection with the news produced on television that are shown

on television in each division of the newsroom. At the beginning of the day, a telephone meeting was held with the Lisbon information team to align the news of the day and to distribute each subject to make news by journalists from both newsrooms, both in Porto and in Lisbon. Depending on the day's agenda, the journalist will then prepare his piece through basic information, on the internet or on the ENPS, check if there are already news on the subject, prepare the interview guide, if necessary, go to the field, record, or record an audio by phone call, or a multimedia content. Then the journalists were responsible for writing the voice-over of the news and recording it in order to assemble the final piece that will be incorporated into a newscast.

Learning radio visual ethnography

“Visual research methods encourage the use of metaphor to communicate knowledge and experience. Visual metaphor acts as a conduit that makes it possible to say things in image form that it is hard or impossible to articulate verbally. This provides a means of accessing conscious and subconscious cognitive stores by facilitating processes of emotion and communication” (O'Regan et al., 2019, p. 11).

One of the main lessons we can learn from the experience in the RTP radio newsroom is that journalists do not feel comfortable behind the camera, but they also do not show discomfort, they are more embedded in the work they have to present and show a more sober posture and are accessible in relation to other journalists. As for the use of digital tools, this is

done by necessity, but there is always a preference for more analogue methods in the production of content. There is a growing concern to have a readaptation to digital and automation methods, verifying an inclusion and remixing of analog and digital processes. We consider the method of information selection and informative expression exemplary to reach wider audiences within the digital.

Documentation environment writing

We consider the radio newsroom environment to be one of the lightest to be in and this presupposes the simplest and easiest ways to create information. “*As an ethnographic research method, observation has a long history. The value of observation is that it permits researchers to study people in their native environment in order to understand “things” from their perspective* (Baker, 2006, p. 171)”. Since the news production environment is favorable, it can also be a determining factor for the accuracy of the news and what is transmitted. In relation to the production of investigative journalism in radio newsrooms, this presents itself with sufficient autonomy to give you credibility, attesting that the investigative journalism process is a more autonomous and isolated activity, compared to current journalism, that seems to unfold on several fronts within the same team.

Live news documentation

“*Design-based research views outcomes as the culmination of the interaction between designed interventions, human psychology, personal histories or experience, and local contexts*” (Hoadley, 2004, p. 204). From our perspective, analyzing the environment of RTP

radio through these aspects made us believe that the live news broadcast in the newsroom of RTP's radio is developed taking into account the news grid of Antena1 and Antena3, at national level. With regard to the news from Antena 3, which presupposes a younger audience, it was found that the news was shorter and with fewer repetitions throughout the day, giving more space to music, as far as the news and major interviews are concerned. RTP1 are performed over a longer period of time, and are repeated more often throughout the day. It should be noted that some news and live interviews make use of visual radio, that is, online streaming to reach audiences with a digital presence.

Photographic follow-up on the ground

The photographic monitoring of radio reports in the field allowed us to understand how journalism unfolds in the field to obtain information. We can see that journalists from different companies communicate with each other in terms of obtaining preliminary information about the event, but there are some journalists who are looking for an exclusive soundbite, integrating their own procedures to reach different personalities. *“Methods are the specific research tools and techniques that will be used, for example, a visual ethnography may use a method of participant produced photo-elicitation to collect data and then analyze and interpret that data”* (O'Regan et al., 2019, p. 11). Documentation of procedures offers us with unique information and metadata on how journalists behave and what facial emotions they express when reporting in the field.

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4.3. Television newsroom workflow

“Observation requires the researcher to spend considerable time in the field with the possibility of adopting various roles in order to gain a more comprehensive understanding of the people being studied. A variety of techniques are used to collect data. Gaining access to the group and leaving the field are two important factors that need consideration” (Baker, 2006, p. 171).

Our experience on television was particularly interesting as it gave us a perspective on how visual narratives are produced as a basic information element in a daily routine. Our main focus was to try to understand how news is produced in a television newsroom and what the structure of thought is used when it comes to an event that requires some level of investigation. This experience lasted two months, where it was possible to analyze, in a participatory way, the daily production routines in the area of television, as well as to understand in detail how to make television news pieces and how to produce a newscast. These processes were possible due to the integration of the researcher in the daily routines of both the production of news for RTP1 and RTP3.

Television goals

Baker believes that participant observation does not have human subjects because the people with whom the researcher interacts are not subject to any experiment (Baker, 2006, p. 184). As with radio, our main goal in putting this ethnographic experience into practice was to understand the workflow of today's journalist and above all what is the workflow practiced by the investigative journalist. Through the process of interpreting the reality and environment lived in the newsroom and in field reports, to find out what are the digital needs in the production of these same news and which tools are currently most useful to journalists.

Investigative journalism on television

The investigative journalism practiced in the North production center of RTP, was expressed through two investigative journalists from the program *Sexta às 9*. By a closer approach to these two journalists, especially journalist Luís Loureiro, it was possible to follow the production processes of investigative journalism of this program, from the conception of the subject, investigation and analysis of data, interviews in the field and post editing of the visual contents. We can say that this process was the most relevant for our investigation insofar as it allowed us to understand how investigative journalism is actually processed from the point of view of portuguese television and was the motto for the realization of an experiential content of investigative journalism which had an extension in the center of innovation, as we will see later.

Television work methods

Since “observation is a complex research method it often requires the researcher to play a number of roles and to use a number of techniques, including her/his five senses, to collect data. In addition, despite the level of involvement with the study group, the researcher must always remember her/his primary role as a researcher and remain detached enough to collect and analyze data relevant to the problem under investigation” (Baker, 2006, p. 172)

the methodologies used in RTP's television newsroom were based on the directives of newsroom directors, who worked in shifts. In some way, communication directors would be responsible for analyzing the dynamics of news that are published in print newspapers, on international television, and on competing channels. The agenda team has a particular job here, as it fills in advance events that are already scheduled, giving space on the grid for eventual events that are impossible to schedule. In this perspective of thinking, the informative topics are equally distributed by the journalists working, who will have to the field in a report with the image team, or if the visual elements are in a database, work on the content from the newsroom.

Software used

We highlight three software that are essential in the production of visual narratives for RTP 1 / RTP3. As far as information research and analysis is concerned, RTP journalists, like radio journalists, use the ENPS, which allows them to see news and information from the main world communication agencies. Allied to this software, investigative journalists also use video editing software, which provides tools appropriate to the exercise of functions to cut

soundbites, what they call mouths, accompanied by images, and thus create a skeleton of the piece of news that will be complemented in the editing studios. This type of information is crucial to *“the analysis stage of field work” when the researcher determines how well the phenomenon studied fits with the conceptual framework guiding the study*” (Baker, 2006, p. 186).

Participatory observation in television:

We can say that what was most relevant in our experience of participatory observation was the possibility of seeing journalists doing the work right next to us, realizing their real needs and real frustrations at work. *“Gorman and Clayton define observation studies as those that “involve the systematic recording of observable phenomena or behavior in a natural setting” (2005, p. 40) (Baker, 2006, p. 173).* By doing that we were able to understand a general methodology in the creation of news that was improved according to the profile of the journalist. Therefore, we can also say that the journalist's workflow varied depending on the profile of the journalist with whom we contacted. Most of the experiments were carried out in the follow-up of reports in the field in which we realized how journalists were approached according to the different scenarios that we analyzed. We believe that the most impactful moment as researchers was when we looked at the experience of doing a report inside the IPO, where we had to do the work of journalists with children and babies who fought for life through cancer therapies.

Investigative journalist workflow

The investigative journalism workflow in RTP's television newsroom is somewhat reserved from other journalists within the newsroom. As it is often about the analysis of sensitive content and that requires a certain degree of anonymity, much of the research content is only known on the day that the *Sexta às 9* series programs were aired. Generally speaking, after interacting with the investigative journalists on this show, the theme of each episode can be a groundbreaking topic or a continuation of a previous episode. Usually, the themes arise with suggestions from journalists who are part of the program, or are suggested by the management team, which at the time was led by Sandra Felgueiras. After delving into the case, the analysis of documents, multimedia elements and other data related to the investigation follows. After analyzing these data, filming is made at the place of the event and those who are willing to talk about the subject are interviewed on video. People don't always feel comfortable doing it, which becomes a redoubled work to find someone available to speak publicly about a subject. After these images have been captured, there is, as in contemporary journalism, the writing of the voice-over, which is then combined with the images being edited. It should be noted that in this type of journalism, infographics are often used, or transition effects of parts of a document, or fractions of an image, elements that combine on the screen to explain something to the viewer.

Newsworthiness criteria

The newsworthiness criteria within television journalism are practically the same as in radio newsrooms, but they change substantially due to the fact that moving images exist as a

component of information. We can mention that the newsworthiness criteria are, in the first place, governmental changes that affect the Portuguese people, crimes and tragedies that have some connection with the RTP public, news related to sport, more specifically football, are topics of focus on television. Everything that has an impact on the daily lives of viewers can be used as news within the RTP newsroom. There is also an emphasis on international news, especially if they are of a political nature and when it affects your world. In our investigation in the television newsroom of the production center in Porto, we saw the culmination of the coronavirus pandemic, as the internship observation took place until the end of 2019, when the first cases of Covid 19 emerged in China. We can thus conclude what the news production environment was like before and after the phenomenon.

Writing routines

On RTP, contrary to what happened on the radio, the production of information only took place during the day, in contrast to the news on radio that took place both during the day and at night. As we have already mentioned, the distribution of tasks is carried out by the information coordinators who, by adjusting the topic to the profile of the journalist, are able to assign the type of work to whoever does it best. Each journalist is responsible for cutting their piece of news, and is responsible for writing and recording their voice-over, which can be done within the newsroom itself, in a small studio, or using the editing rooms that are prepared for this purpose. The assembly of the piece is always done jointly with the editing professionals, with a small conversation during this edition to reach a conclusion about the content. After this work is done, the piece is available for a few days in the database to be later incorporated into the news.

Visual ethnography in television

The application of the exercise of visual ethnography in the television newsroom differs from that of radio, insofar as journalists are already used to exposing cameras. *“Visual images enable visual ethnography to capture a culture's fluid and shifting data but it is also necessary to accept that translation of images to text is subjective and categorization reductive. In some ways this subjective and reductive practice is mirrored by the discipline in clinical imaging in the act of image interpretation: the latent knowledge in clinical images is reduced to text and transferred to a tangible clinical report”* (O'Regan et al., 2019, p. 11). In terms of the environment, what we can understand is that on television there is more concern with the visuals and the clothing, so one can see a rigor of a good image in all journalists. There is not as much collaboration between journalists as seen on the radio, the work environment is quieter, and there is an equal concern between voice projection and images that complement the speech. Therefore, there is an effort to find the right images for the journalistic piece, but the speech also reduces the words used on the radio by fifty percent, because the voice-over cannot repeat what is in the image, only to reinforce information. Both image and voice contents match each other to result in a cohesive, fast and effective piece of information in the message to be conveyed.

Writing environment

The television newsroom environment is structurally and physically divided, depending on the type of work that is produced within RTP's television newsroom. Firstly, we have the desks of the information coordinators next to the televisions connected to the main information

channels. Since *“is in this role that the researcher becomes more involved with the insiders’ central activities but still does not fully commit to “members’ values and goals”* (Baker, 2006, p. 177) then we believe that there are two types of journalists who can work on any topic, it was in these lines that we developed our investigation. On the right side are all the employees responsible for producing the daily agenda, making primary contacts and the producers dealing with all the logistics necessary for the reports. In the central part are all the journalists, directors, who are responsible for the production of the nearest news, including the anchor that will present the news. In the last rows of the room are sports journalists, and next to them, on the right, are the desks of investigative journalists.

Live news documentation

At times, we closely follow all the logistics and production necessary for the issuance of live newspapers. We photographically record the news produced for RTP1 and RTP3. It was also possible for us to do the exercise of reporting our own newscast, where we were filmed presenting news such as an anchorwoman from RTP, and this exercise was recorded and can be viewed through this link. From this experience we can understand the dynamics behind the broadcasting of a newscast, what is essential to know to do the anchorwoman exercise and what kind of news are selected to complement the news grid. We can say that the most demanding is the rigor of the speech when changing cameras, and the body posture during the whole live. From this experience we can also see what types of digital tools could be interesting to help investigative journalists in live situations.

Photographic follow-up on the ground

“If the researcher is already a member of the group, she/he is interested in studying, then gaining access is not a problem. The issues for these researchers are whether, when, and to whom to disclose oneself as a researcher (...) despite well-planned research and/or particular interest in a group, gaining entry is not an easy process” (Baker, 2006, p. 180).

With regard to visual ethnography of situations in the field, it is shown to be of greater interest in allowing us to capture the dynamics between journalist and image reporter, and how field reports are processed, taking into account all the logistics that are necessary for recording images or to make live. From the times that we followed the broadcasting of live broadcasts, we verified how journalists prepare themselves in an informative way to speak to the camera during a certain period of time. We also had the opportunity to carry out a false direct exercise in which we reported the visit of Marcelo Rebelo de Sousa, the Portuguese President, to a school.

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4.4. Innovation center studio

As we believe our purpose as researchers in RTP was “to *“maintain a balance between being an insider and an outsider, between participation and observation” and that “the researcher may limit involvement in the group, fearing that it will affect her/his ability to interpret the data from a detached perspective”* (Baker, 2006, p. 176) we can conclude that the experience of the innovation center as the culmination of the entire ethnographic experience on the journalist/creative procedure in the northern production center of RTP. Although this center only has one journalist, Mário Augusto, director of movies show “Janela indiscreta”, all the production that takes place in this center aims to produce multimedia content and documentaries essentially for RTP2, and with some regular information pieces in the area of infographics to complement graphically the news pieces that require some kind of complementary graphics, especially the big reports and reports of the program *Sexta às 9*.

Innovation center goals

Our main goals of analysis at the innovation center were, in a first phase, to understand what methodologies were used to produce digital narratives, in the same way it was also our intention to understand the level of innovation that this center had. In a second phase, we understood how this center complements the production of information from both radio and

television newsrooms. Finally, our goal was the production/planning of an interactive documentary within investigative journalism, taking into account the investigation methods commonly used in this center, which we later identify as design thinking. We came to a single conclusion about the significance of design at this center, and we understand that *“design is now central to innovation and since organizations are under pressure to maintain or grow market share, or if in the public sector, increase user satisfaction and effectiveness, then designers and their thinking have something important to offer”* (Kimbell, 2011, p. 287).

Investigative journalism at the Innovation Center

The only link that existed between the innovation center and investigative journalism at RTP, we can essentially talk about the production of infographics, which we realized that despite being part of innovation, it was represented in an office closer to the television newsroom and this made so that journalists who were doing some type of report would go (physically) to the infographics in order to discuss with them complementary ideas to graphically perform the representation of data necessary include in visual pieces.

Innovation Center work methods

We identified that the main working method of the creatives at the Innovation Center was based on design thinking, this made all creatives have a particular role in each project, thus distributing the tasks according to the specialty of each creativity. This made the projects move from professional to professional adding the work of each one. *“Design thinking has been used*

to characterize what individual designers know, and how they approach and make sense of their own work, as well as how they actually do it. In addition to describing the practices of designers, the term also offers a theory of design that extends Herbert Simon's ideas. In this context, design does not give form to things; instead, it concerns action and the artificial" (Kimbell, 2011, p. 296).

According to our observation designers primarily do the planning of the entire project, taking into account the budget of the project. Depending on the execution time limit, the funds and the available resources, the projects were executed according to the schedule previously outlined, especially when we talked about projects that needed to be recorded in the field. The methods used also varied depending on the software appropriated for the project. If the project had to go through *adobe premiere* and *adobe after effects*, it is first edited in premiere and only then are the secondary effects applied.

Software used

We can say that the software used was mainly from the creative cloud, so creatives work with software widely used by designers internationally. These softwares were used on the computers of the Innovation Center, which means that the files and data produced in this center are not accessible in a database logic for all journalists in the RTP universe. Another relevant factor to mention is that this center uses its own materials for capturing video and photography, which gives them another kind of freedom in terms of content production. It is also necessary to emphasize that the team responsible for the infographics that are incorporated in the news mainly use the *Adobe After Effects* software, and its work logic is based on the software presets.

Participated Observation Innovation Center results

One of the main lessons we can learn from the experience of participating in the observation at the innovation center is that *“designers need to attend more closely to the continuous dynamic composition of the system and its environment, and how they together differ from the environment in separation”* (Jarke et al., 2011, p. 997). We came to a conclusion that the working hours differ from other newsrooms, insofar as adjusts to the needs of producing information. If a project requires more hours of work in a day, creatives adjust their work hours accordingly. We also realized that certain tasks, such as subtitling, adjusting the audio and editing of major projects, are done in separate rooms, which allows a more focused environment for the creative to be able to edit their content. The monitors used in this center are also particularly larger than in other newsrooms, not least because we are talking about increased rigor in image quality.

Investigative journalist workflow

“Requirements researchers stated that requirements are properly concerned with what is to be achieved by a design artifact, without regard to how it will be designed and implemented” (Jarke et al., 2011, p. 994). We believe that our experience at the innovation center in finding requirements needed to adjust the investigative workflow led to us finding that infographics are one of the tools needed to integrate in our system in order to simplify information to the investigative researcher.

We can say that the innovation center is not based on a routine associated with the creation of investigative journalism content, however there is a very strong link between the

infographic production center and the group of investigative journalists. All content and data that need visual expression to be integrated into television news are developed by a team of four designers who work in shifts, to ensure their presence when creating informative content both by the television newsroom and by the radio newsroom. Although there are no investigative journalists at this center, there is a binding relationship in the work that is carried out at this center in order to improve the visual content produced in other newsrooms.

Newsworthiness criteria

“The design requirements problem succinctly pointed out can now be stated as follows: what is the emergent behavior and dynamics of the software artifact and its environment in their evolutionary trajectory? Now users, designers and other stakeholders need to ask: will the system continue to satisfy our emergent goals, and what those goals could be expected to be during the artifact’s lifetime; in contrast to the older problem: what are the (fixed) goals of the system and what is it expected to do?” (Jarke et al., 2011, p. 997).

Regarding newsworthiness criteria, we were able to see that these were expressed when there was some type of project in the information field. We notice a great focus on these criteria when we analyze the creative process of integrating infographics, or informative tabs to accentuate some type of information to be highlighted in the news. In general, the creatives of the innovation center do not base their work method on the assumptions of information and journalism and we can say that they even have a different perspective on information, being therefore characterized by being a more alternative team, both in the approach of the themes,

as in the methodology implemented, through design thinking. As they deal with projects in the field of fiction, it made the critical spirit within the team more inquisitive about the processes of transmitting information from the other teams. We then realized that the innovation center team appears in the RTP universe as an alternative support for the execution of projects, as the content of RTP2 is for the content of RTP1.

Project execution routines

The project execution routines within this team vary largely with the distribution of projects made by the director of informative production of RT2, Pedro Bessa, from the northern production team. The projects developed at this center have the particularity of being executed from a team rotation perspective, depending on the abilities and skills of each professional. In the same way, we talk about the elasticity of schedules that suit the type of work and personal routines of each creative, so that the work is performed more efficiently.

Learning Visual Ethnography Innovation Center

As we stated in previous subchapters “*visual ethnography is both a methodology and a method: visual technologies, images, metaphors and ways of seeing are intertwined*” (O'Regan et al., 2019). We can say that the documentary records at a visual level were made in this center through documentary photography. The records were made within the environment of the innovation center as well as field trips to shoot fiction or other informative elements. We also recorded the infographics production environment, in the two rooms available for this

purpose, recording the dynamics of the designers in the creation of infographics and other design elements that would later be integrated into the reports.

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4.5. Experiment results

“Participatory research is also situated in a more politicized agenda concerning power and knowledge relationships in both research and society as a whole. Question about control and power, and the potentially exploitative relationship between researcher and researcher, led to attempts to facilitate collaboration in the research process, especially where the researchers are service users” (Clark et al., 2009, p. 346).

The main conclusions that we can draw from these observation experiences, participated in three different environments in the RTP universe, is that what sustains the rigorous creation of information in this public station, is the length of routines and work processes that must be kept in line by all journalists. The radio journalism team has a more cohesive and mature reporting process and teamwork is evident in the different phases of the journalist's workflow. As for the television information production environment, it is admittedly more rigorous and more structured in terms of the team, with the work of a section within the newsroom depending on the follow-up of the process to another team. *“Snowball sampling is a good method to use because insiders who have been referred by a friend may be more willing to talk with the researcher. Biernacki and Waldorf (1981) identified some of the problems associated with snowball sampling that have received little attention in the literature” (Baker, 2006, p. 182).*

Considering that we used snowball sampling to achieve the cluster group of analysis, the work within the television newsroom is more sectioned and each journalist or television professional is assigned a specific task, which makes the flow of news broadcasting more solid and accurate. Regarding the production environment of the innovation center, we are talking about more creative and dynamic processes and less rigidity with regard to the basic structures of information production.

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4.6. Experiment main hypotheses

Radio's main hypotheses

We believe that collaborative and more rigorous processes in the selection of information in the radio newsroom can be fundamental for designing part of our journalistic workflow. We believe that the news with less than one minute and the production of visual radio can be elementary to have a minimum unit of information to use in our software.

Television's main hypotheses

Regarding the television experience, we understand that the most important was the discovery of a real need within the investigative journalism practiced at RTP, to have a tool capable of organizing investigation data and placing the most relevant data in a timeline capable of guiding and visually assisting the journalist in the investigation process. We consider the process of creating scripts/voice over for journalistic pieces to be exemplary for the journalist's objectivity in very complex processes and with a lot of information. It was also from this experience that we identified the value, although modest, of data journalism in the practice of Portuguese investigative journalism.

Innovation Center main hypotheses

Regarding the innovation center, we understood design thinking methodology and how it could be integrated in the software design to encourage creativity and the use of intuition as a fundamental process of investigative confluence. It was in this center that we realized that infographics and data journalism can be preponderant for a superior quality of content creation.

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4.7. List of requirements

After the experience at RTP, we were able to conclude which journalists' needs stood out the most. Of all the needs found, we created a table that reflects the most important needs and their interpretation as system requirements.

Table 1 Summary of critical design requirements issues	
Critical requirements issues	Brief description
Update with the latest news	Every journalist must keep up with the latest news in the world, so our system needs a board which informs the top ten news, updated regularly
Need to organize data	The necessity to organize various types of data (docs, jpg, txt) in chronological order
Summarize content	The need to know in a superficial way the content of thousands of documents that the journalist needs to read

Integration of infographics	Use of infographics to create an output that packs all the information about the investigation so the journalist can use it to create the article/documentary and share it with the community
Human limitations in design	Take into account the limitations of human mind and body in order to achieve the maximum cognitive efficiency

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5.1. Nature of the investigation

The idea for this investigation came up during the Algorithmic Science News research project, funded by the Google Digital News Initiative, namely in the investigative part in which it was necessary to analyse the existing software and platforms with regard to the production of science journalism at a global level. From the moment we identified a need, or at least the lack of platforms in the field of investigative journalism, we identified a clear requirement to develop a solution adapted to the typology of investigative journalism. Despite identifying this need, in the current scenario, we think it would be interesting to understand, from a practical point of view to what extent a platform to support the journalist's usual procedure in real contexts is, in fact, necessary. In this way, we decided to carry out an ethnographic experience within a Portuguese communication company in order to understand what is the usual procedure of the investigative journalist and what are the main difficulties found in the execution of this type of journalism and that can be suppressed by the integration of artificial intelligence in newsrooms. We chose RTP's as a case study. As case studies also seek to include multiple perspectives by collecting information from a range of different stakeholders, such as commissioners, professionals and service users, they can document multiple viewpoints and highlight areas of consensus and of conflict (Moriarty, 2011, p. 16), we thought it would be pertinent to carry out a cross-sectional study of the different ways of action existing in the CPN, namely the study of the newsroom of Antena 1 radio, the newsroom of television of informative

production of RTP1 and RTP3 and the innovation centre where infographics and projects based on data journalism are produced.

The main nature of this investigation was to understand the reality experienced by journalists within newsrooms, so it became significant to understand, from a closer reality, what are the true needs of journalists, especially investigative journalists, during the usual research procedures about a subject, the gathering of information on the ground, the in-depth research instruments and all the needs that, hypothetically, can be suppressed with the help of tools, algorithms and platforms that have the purpose of reducing the journalist's time in the production of informative content.

“The value of public service news has traditionally been defined in terms of provision of a universal offering characterised by diversity of output and editorial independence from government and commercial interests (Hendy 2013), and situated in a normative conception of journalism as the “fourth estate,” holding power to account” (Jones & Jones, 2019, p. 1161).

Therefore, when considering the use (as a reference for our project) of a public service company producing information, we intend to add added value to the data collected in that company. As our investigation has a closer character to the reality under study, this made our project have an added value, since *“concerns have been raised related to a researcher's “closeness and distance” from his/her data, and early critiques have suggested that users of software data analysis lose a closeness to their data “through segmentation of text and loss of context, and thereby risk alienation from their data” (Owen, 2014, p. 14).*

With ethnographic experience at RTP, it was possible to closely observe these usual procedures and gather concrete data from journalists and information technicians that could map this reality and inform about potential tools to be created. With this, it will be possible to draw more specific conclusions about the reality of investigative journalism and to understand how it will be possible to design a system capable of suppressing these real difficulties - *“in case studies, the intention is to provide a 'telling case' out of which theory, concepts and hypotheses can be drawn. Insights from these studies can then be transferred to other situations where similar conditions exist”* (Moriarty, 2011, p. 15).

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5.2. Data collection and processing tools



Figure 2 - Infographic of all surveys and interviews carried out at RTP's CPN.

Taking into account that “data collection is a process of selectively choosing empirical phenomena and attributing relevance to them with respect to the research question” (Bergman & Coxon, 2005, p. 4) we consider it pertinent, in addition to the conclusions drawn from participant observation, to structure ways of collecting specific data capable of guiding us on the detailed needs of automation in journalism that may be basic for the idealization of tools to

support journalistic production. In addition to the theoretical and empirical results that we were able to draw through participant observation, we consider it relevant to collect specific data using two methods. The first was achieved through the application of 64 surveys to the different sectors studied in the CPN of RTP. *“Observation is a key component of ethnographic research, although not all observational studies use ethnography. Although some textbooks distinguish between observational and interview data when describing ethnographic research, considerable blurring between the two is likely to occur during fieldwork”* (Moriarty, 2011, p. 21), therefore we consider that data collected on surveys and interviews are a way of add value and credibility to the participant observation study and thus make a case study relevant both for prototype idea design and for concluding conclusions regarding the use of AI and automation within journalistic production.

“The quality of the data collection process in qualitative methods can be divided conceptually into the quality of the instrument or other method of data collection, and the quality of the data obtained from the instrument”

(Bergman & Coxon, 2005, p. 4).

The second method was achieved through the application of interviews centred on professionals of interest, where it was possible to understand, from a more qualitative and in-depth point of view, the technological needs of journalists and their broad opinion on subjects associated with artificial intelligence and journalism investigation. The quality of both the surveys and the interview guides must be evaluated based on the way they were constructed, which is why we must emphasize that both surveys and the interviews were carried out at an initial stage of research, so that their length and content are shared by a generalist character.

However, when analysing these two methods of collecting information, a precise analysis model focused on the research objectives was used, so that the results of the evaluation of these data are preponderant to integrate this study into the scientific panorama.

Through the surveys, it was possible to draw conclusions about the majority of opinions regarding our project. The interviews, on the other hand, allowed concluding specific conclusions about the journalist's workflow, taking into account the sector of each journalist. Therefore, we can say that a hybrid data analysis will be useful, combining qualitative and quantitative methods in order to arrive at concrete conclusions about the collected data. *“Nothing better captures the difference between quantitative and qualitative methods than the different logics that underpin sampling approaches. While quantitative methods typically depend upon probability samples that will allow confident generalization from the sample to a larger population, qualitative inquiry typically focuses in depth on relatively small samples selected purposefully”* (Moriarty, 2011, p. 7) .

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5.3. Data validity and reliability

“A well-designed conceptual framework serves as the “scaffolding of the study” consisting of “categories” and “descriptors” (or dimensions as described below). These initial categories/dimensions serve as the “backbone” of a study and help in developing the research process and methodological design, which in turn facilitates choice of data collection methods “ (Owen, 2014, p. 2).

The validity of the collected data stands out due to the fact that these data were collected during a participatory ethnography exercise, where these works were obtained from credible and recognized journalists in the national panorama. Therefore, there is a valid character of the answers obtained in the surveys and questionnaires because it is based on the inflection of knowledge based on experience. *“Reliability is often used to refer to the consistency of survey responses over time”* (Glasow, 2005, p. 2) which is why we emphasize that all surveys were completed with the presence of researchers and all interviews were conducted personally within the professional environment. As the answers come from the measurement of experience after several years working as a journalist at RTP, we believe that the value of the answers can be prolonged for many years, until there is a change in the technological paradigm that fundamentally changes the structure of thinking about work carried out in the field of journalism. In global terms, we were only able to obtain exact information from five

investigative journalists working in the area, all the remaining journalists may have had some experience within investigative journalism, however we cannot consider them as effective investigative journalists working in the area. *“It is always possible that the sample differs quantitatively from the population, even under careful random sampling. The sociolinguist seeks to conclude whether the patterns observed in the sample are likely to generalize to the population, but the women in a sample, for instance, may not be representative of the women in the population”* (Gorman & Johnson, 2011, p. 2). Therefore, all the lessons that we can draw about these five investigative journalists will be the conceptual basis for understanding how investigative journalism works in Portugal.

Despite the construction of the prototype idea being based on different scientific perspectives and different inputs that served as inspiration, we have to recognize that the result of the data analysis is sufficient to realize the idealization of tools that can help this group of professionals. As we use the real needs of radio and television journalists as a conceptual basis, with more than a decade of experience in journalism, these data serve as a reference not only to conceptualize the *CTD* tool conceptually, but also to outline scientific conclusions of the paradigm shift. *“Many qualitative studies use convenience sampling (so called because the sample is selected at the researcher's 'convenience' – the use of shopping centres in market research is a familiar example of this type of sampling)”* (Moriarty, 2011, p. 8).

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5.4. Survey analysis

“The task of the researcher is presented as finding and exploring categories and patterns of categories in unstructured, even chaotic, records. To do so is to make sense of, understand, expound and illuminate, the records. This task is clearly assisted by the ordinary coding-and-retrieval function that almost every program for computer aided qualitative data analysis provides” (Richards & Richards, 1994, p. 81).

Three different types of surveys were applied, adapted to each newsroom/medium in which we found ourselves. All surveys were divided into three distinct parts to be completed. In all, 64 surveys were applied, 31 came from the ethnographic experience on television, 18 from the ethnographic experience on the radio and 13 from the Innovation Centre.

The first part was dedicated to the selection of news, in which we tried to understand what kind of platform and means are used by journalists as sources of information. In the second part, we focus on the

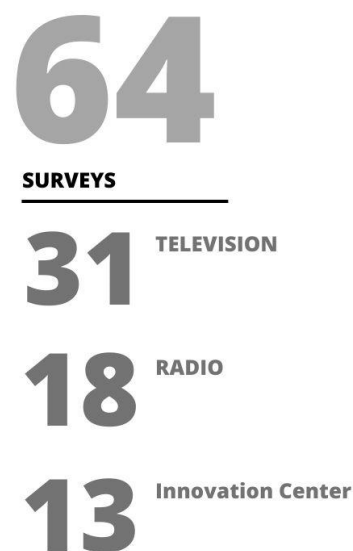


Figure 3 - Infographic of total surveys per newsroom.

news creation part, where we try to understand the usual procedure that each journalist follows. To create news what parameters do they use in data collection in reporting. In the last part of the questionnaires, we tried to find out what is the opinion of the participants regarding the creation of an automated platform and what they think about the introduction of programming and the concept of data journalism in newsrooms.

It should be noted that some questions that were raised in the surveys were not taken into account in this analysis, due to the fact that they are too general for what we intend to understand about the reality of artificial intelligence in journalism.

One of the questions that we consider important to study in a transversal way is based on knowing if the information contents are created from scratch by journalists or if journalists use previous information published by other journalists as the basis of their work. We did not introduce this issue to the Innovation Centre technicians because there are no journalists interviewed carrying out information production functions in this centre.

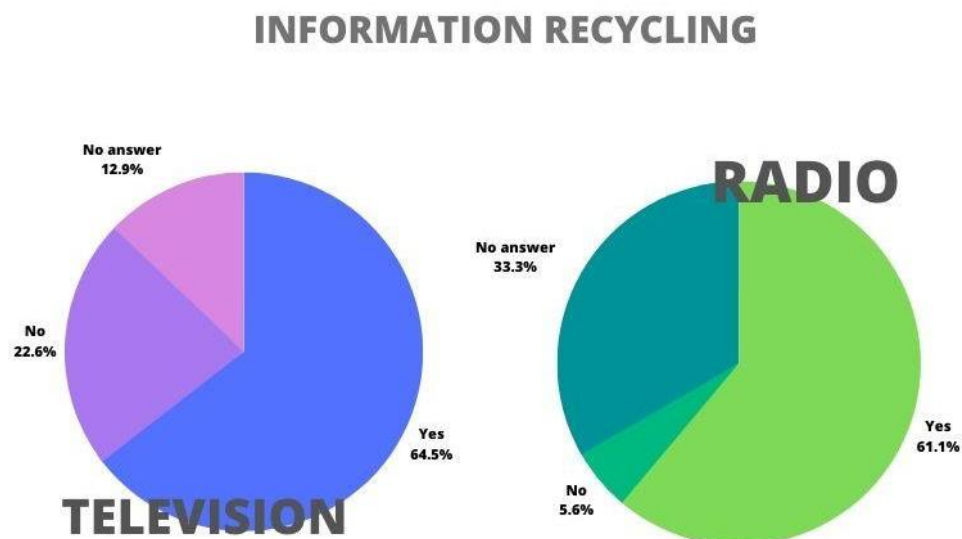


Figure 4 - Percentage of information recycling on radio and television.

We observed that more than half of the journalists, both in the radio and television newsrooms, use news created by other journalists (mainly in print journalism) to create their news content. This means, to a large extent, that there is a recovery of daily information and that the structure for disseminating news in Portugal is based on a web of journalists and the daily production of information.

Regarding the question about the software and platforms used by journalists for informative research and creation of journalistic pieces, we obtained different results considering the different media studied. While on radio the most used software are ENPS and DaletPlus, on television the most used software's are ENPS and QCut. Both the radio and television newsrooms use the ENPS software on a daily basis, to have direct access to press releases, news from news agencies that work directly with the system, as well as the creation of written content, with essential parameters such as characters and words and an estimate of the text in minutes, relative to voice-over or radio parts.

SOFTWARES USED

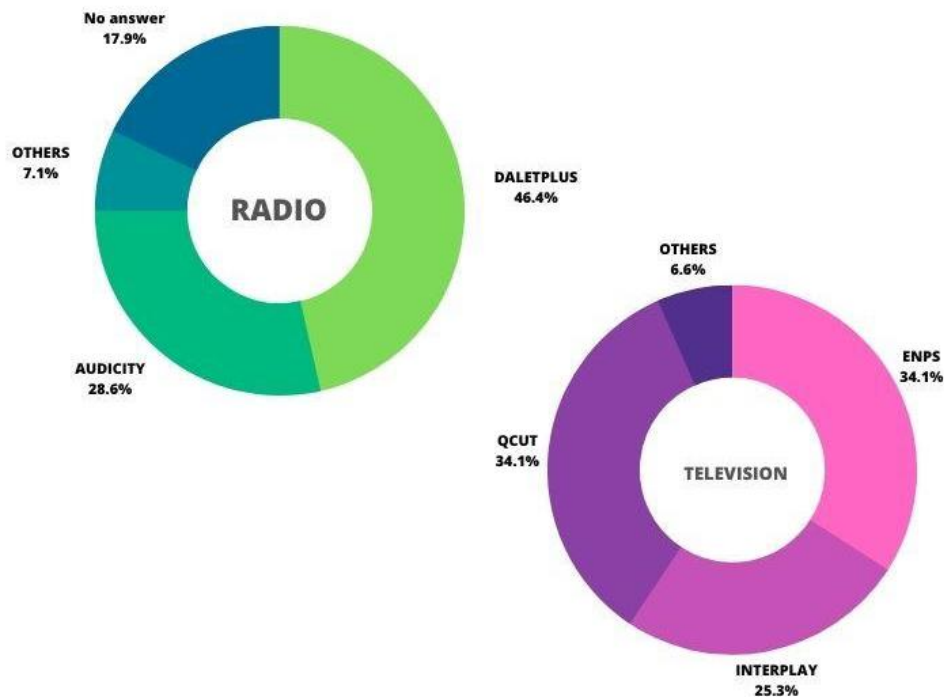


Figure 5 - Percentage of use of software available on RTP's CPN.

Interplay refers to the software used to manage the contents of the RTP archive, which was one of the basic reasons that led us to choose the public journalism company RTP, as it was the first television station in Portugal, thus having a large collection of filmed and radio content of historical events. *“Surveys are capable of obtaining information from large samples of the population. They are also well suited for gathering demographic data that describe the composition of the sample. Surveys are inclusive in the types and number of variables that can be studied, require minimal investment to develop and administer, and are relatively easy for making generalizations”* (Glasow, 2005, p. 1). Because this way of obtaining information is so rich, we decided to try to gauge the global opinion of respondents on the hypothetical creation

of an automatic platform to support investigative journalists. This question was asked about different expressions in the different media studied, but in line with these answers are able to indicate the level of confidence of respondents about the inclusion of artificial intelligence and automated processes in the usual procedure of information production.

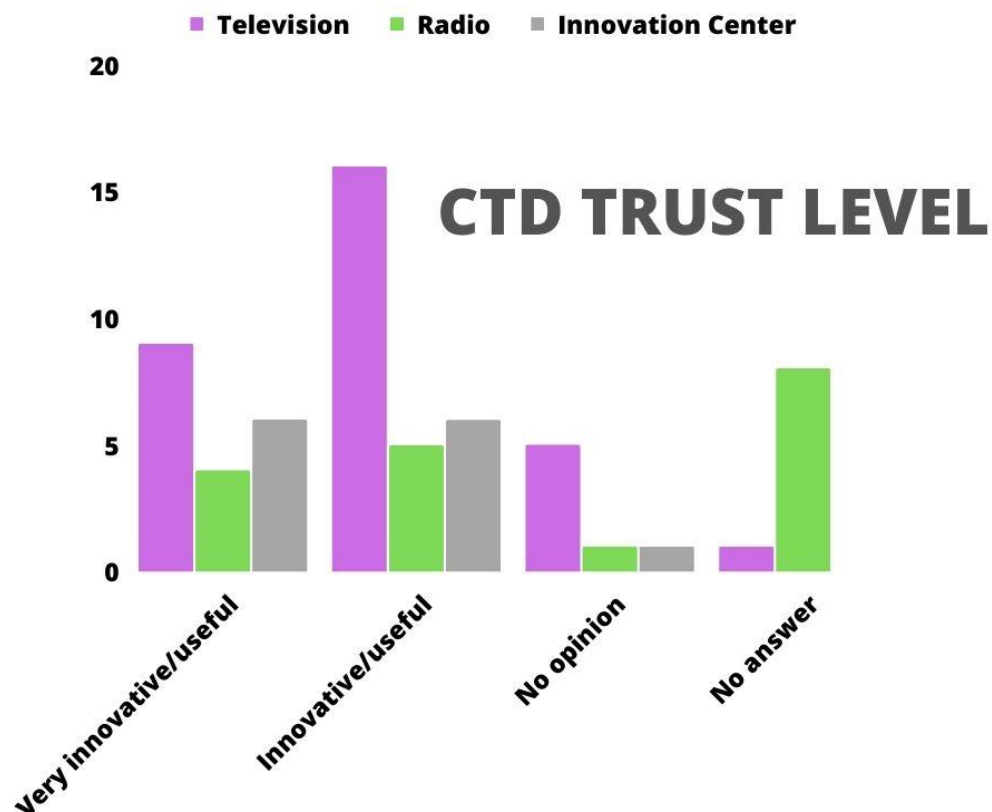


Figure 6 - Level of confidence in the CTD platform and automation processes.

“Kraemer (1991) identified three distinguishing characteristics of survey research. First, survey research is used to quantitatively describe specific aspects of a given population. These aspects often involve examining the relationships among variables. Second, the data required for survey research are collected from people and are, therefore, subjective. Finally, survey research uses a selected portion of the population from which the findings can later be generalized back to the population” (Glasow, 2005, p. 1). We can clearly see that confidence

relative to the AI is considered useful in most cases, but not very useful, especially with regard to television respondents. At the Innovation Centre, opinions are divided between being useful or very useful. Therefore, we can verify that respondents trust artificial intelligence, but that this trust is neither total nor effective, so we can consider that there is some scepticism regarding the introduction of automated processes in newsrooms. In any case, television journalists have a higher level of confidence in the AI than the other news production centres.

“In contrast to survey research, a survey is simply a data collection tool for carrying out survey research. (...) Surveys can also be used to assess needs, evaluate demand, and examine impact” (Glasow, 2005, p. 1). In this matter, we also tried to understand how journalists see new ways of producing journalism more connected to computing and programming languages, to try to conclude what is the impact and effective presence of data journalism in current newsrooms. We did not ask this question in the radio survey structure, because we only consider the inclusion of this term relevant during the ethnographic experience in television studios.

Only 48% of respondents on television believe that the future of journalism will pass through the integration of data journalism and programming in newsrooms for news production, already at the centre of innovation, more than half, about 54% believe that the future of journalism will pass through journalist's ability to adapt to programming and the use of data analysis techniques, such as data journalism.

DATA JOURNALISM AS FUTURE

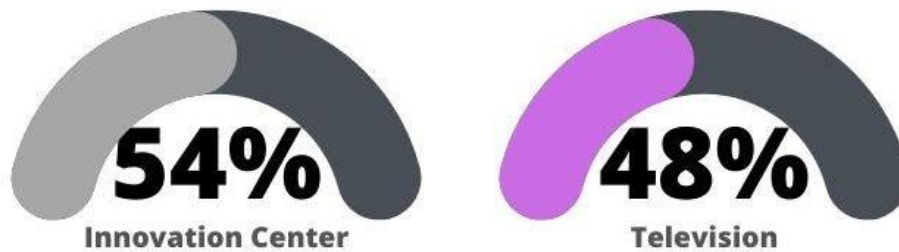


Figure 7 - Level of confidence in the CTD platform and automation processes.

“Closed-ended questions with ordered choices require the respondent to examine each possible response independent of the other choices. The choices form a continuum of responses, such as those provided by Likert scales and numerical ranges. These types of questions are easy for respondents to answer and for researchers to analyse the data” (Glasow, 2005, p. 8).

Following the question about the future of journalism related to data journalism, we asked two questions at the Innovation Centre regarding issues related to the production of information on radio and television. In the first place, we tried to understand what is the opinion of communication technicians, linked to journalism, but who are not effectively journalists, about the importance of investigative journalism today. Around 54% of the respondents answered that the role of investigative journalism is very significant nowadays, a question that was occasionally developed in an interview with some technicians who work more closely with the reality of investigative journalism, such as the infographics responsible for create infographics present in the investigative journalism program *Sexta às 9*.

ROLE OF INVESTIGATIVE REPORTING CURRENTLY



Figure 8 -Percentage of the significance of investigative journalism in the current scenario.

With regard to the question about deliberate access to information for all people, 69% of respondents believe that everyone should have full access to information, information that is linked to information consumption by citizens on digital platforms. *“The respondent's beliefs, attitudes, and behaviours are imprecise and apt to change over time. Beliefs are subjective opinions that indicate what people think. Attitudes are subjective opinions that identify what people want. Behaviours are objective facts of what people do. Attributes are objective facts that describe what people are. These also change, but over longer periods”* (Glasow, 2005, p. 9) . Given this, we believe that this opinion regarding informative access can be changed depending on the course of events regarding fake news, citizen journalism, disinformation and other issues raised to free access and informative production, which may eventually cause constraints in terms of the credibility of sources and the transparency of contents.

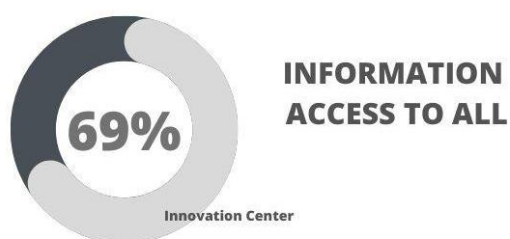


Figure 9 - Percentage of belief in free access to information for all.

In addition to the closed-ended questions that we present, we also placed some open-ended questions within the questionnaires, since “*open-ended survey questions allow respondents to answer in their own words. Open-ended questions also allow the researcher to explore ideas that would not otherwise be aired and are useful where additional insights are sought*” (Glasow, 2005, p. 7). In general, we asked four open-ended questions in which we used a qualitative analysis to assess what kind of conclusions can be drawn for our system.

News platforms used

In a global way, the respondents, from all the newsrooms, mentioned that they use the daily newspapers, some radio stations and 24-hour television channels globally as an information source. We also noticed that respondents refer to accessing digital platforms, and the Internet on their cell phones to watch the news. On a smaller scale, we can understand that some of the respondents use physical references such as books, magazines and printed newspapers. In general, all journalists use mobile applications to access news and information and also other media and digital and physical publications to access daily information.

Journalism workflow

We identified in a global way that all the journalists who responded to the survey, in a first phase of the Workflow, the journalist analyses the data that already exists on the subject, that is, review the information to see all the contents that are already in possession of the journalist. And then we see that the journalist will contact the sources, that is, he will listen to all parties, understand what is, in fact, reality and what is a lie. Then go to the field, see if the data they

had previously can be validated as news. Then we also verify that the journalist, after this work on the field, build the journalistic piece, based on a simplistic language and focused on the type of listener or the type of spectator, thus making his journalistic piece actually have a content credible and valid and that is constructed in a language accessible to all.

Field work criteria

With regard to the work of the journalist in the field, as an intervention the addition of data related to his journalistic research, we perceive that, in general, journalists make use of fieldwork to put on the shoes of the intervenient in question, to see through the people's eyes, what is happening also to listen to all the players and all parties and understand all the angles and perspectives of the subject. Therefore, the journalist on the field uses newsworthiness criteria to filter the ambient and tries to sensitively determine what is happening in order to be able to report on the subject.

AI solutions to help journalists

In this matter, we asked all journalists and communication technicians to inform about ideas or suggestions for platforms or tools that could, in some way, improve or facilitate the work of journalism. We got varied responses, but many of them were repeated, namely with regard to verifying sources and accessing global databases. There was also reference to access to organization software. Occasionally, they mentioned the automatic creation of graphics and templates for mind maps. Some respondents mentioned data crossing and tools that would help the immersion experience. From the point of view of television, some journalists mentioned

that it was interesting to have access to a digital file by subject and a verification of information that crossed everything that was written with official topics. There was also a suggestion to incorporate verification of fake news.

Chapter 5. Perception and action - flow and dynamics of the radio and television journalistic method in the digital age: surveys and questionnaires

5.5. Interviews analysis



Figure 10 - Percentage of belief in free access to information for all.

“The face-to-face interview is a particularly flexible tool that can capture verbal inflexion, gestures and other body language. A skilled interviewer can obtain additional insights into the answers provided by observing the respondents body language” (Glasow, 2005, p. 4).

The interviews were applied as a complementary and in-depth way of approaching the various journalists encountered during the ethnographic experience at RTP. Transversely to all interviews, we tried to understand what was the background and specialty of each journalist.

“The responsive interviewing model “relies heavily on the interpretive constructionist philosophy, mixed with a bit of critical theory, and then shaped by the practical needs of doing interviews.” This approach is somewhat the opposite of a strict positivistic approach in that the design of the process “remains flexible throughout the project” and the goal is not to reach definitive answers or truth, but rather to seek out how the interviewee “understands what they have seen, heard, or experienced.” According to the interpretive constructionist researcher, the goal of an interview is to find out how people perceive an occurrence or object and, most importantly, “the meaning they attribute to it” (p. 27)” (Owen, 2014, p. 9). In this way, we tried to understand what opinions the interviewees had about the introduction of automated and robotic processes in newsrooms. What kind of specific needs do they find in the process of creating news and what is the opinion of these same journalists regarding the contours of the future of journalism and the concrete future of investigative journalism. Taking into account its technological extension, it should be noted that there was a clear separation of the interview scripts in relation to current journalists and investigative journalists, as well as other communication technicians who are not part of journalism. Since “interviews remain the most common data collection method in qualitative research and are a familiar and flexible way of asking people about their opinions and experiences” (Moriarty, 2011, p. 8) all interviews were based on the specific design of real needs and critical opinions of Portuguese journalists in order to conclude structuring theories about artificial intelligence in the production of information.

In a way, we focused on four questions with a similar nature in all newsrooms, in order to understand what kind of information would be useful for the design of the *CTD* system and what kind of data could be considered for the implications for the theory, that is everything that can be considered pertinent to the advancement of science.

Software and tools used

“Qualitative interviews are generally described as either being semi-structured or in-depth. The former is based on a series of open-ended questions about a series of issues the researcher thinks are relevant to the topic” (Moriarty, 2011, p. 8). For this reason, we think it is important to design the *CTD* system, to study what software and tools are used by journalists and that somehow, they can map what kind of tools should be introduced in the *CTD* system. In a global way, in all the interviews, the use of software that is basic in the newsrooms of Antena 1 radio and television RTP, um and RTP 3 was mentioned. Therefore, we are talking about software such as ENPS, QCut or Dalet Plus or Interplay. In addition to these software, journalists and communication technicians occasionally refer to information platforms such as *YouTube* or social networks such as *Twitter* and *Facebook*.

Potential tools and platforms that could be created.

We consider this question to be the most pertinent and influential one to draw conclusions about potential tools that can help in the production of journalism, *“by tracing the processes that have contributed to differing participants' experiences and by collecting participants' own explanations of what has happened to them, it is possible to understand why people behave as they do in particular situations or in response to certain stimuli or interventions”* (Moriarty, 2011, p. 3). In this way, we are able to perceive, through the difficulties met by journalists and communication technicians, a margin of possibilities for the creation of tools that can overcome these difficulties. In a global way, we perceive that the interviewees refer as potential tools for creation the verification of the sources and the creation of a kind of polygraph. In other

interviewees we noticed that there was a need to organize the data through timelines and visual maps. So, the two main ideas that came out of the interviews were actually checking data and organizing data into a visual expression.

Information consumption habits on digital

Through the interviews, we were able to observe that the information consumption habits of journalists are transversal to all newsrooms. The journalists in the interviews mention that they use social networks and digital platforms to access information on the internet. They also use newspapers, radios and televisions to analyse the news of the day and information that they consider relevant. They also speak of accessing *Twitter* and other similar social networks to obtain information from politicians or high-powered personalities, accessing their personal accounts. And we highlight the testimony of one of the technicians at the Innovation Centre, who says that the journalist is like a librarian and that this function of searching through various sources is indispensable as a foundation and pillar of social democracy.

Opinion on automation and artificial intelligence

We found that in the interviews, the opinion of the interviewees regarding automation and artificial intelligence comes from a more practical perspective, including thoughts and conclusions regarding the type of medium of each interviewee, that is, the television interviewees mentioned innovation factors in relation to the content's television. They suggested, for instance, the introduction of shorter videos in the news, referred to a news structure adapted to the consumer's style. On the radio, the opinions focused on innovative

considerations in publishing radio content on digital platforms, and on the Innovation Centre, the interviews focused on a broader perspective of innovation, in relation to the consumption of information by digital platforms and the aggregation of various media. communication on a single platform. From a general perspective, opinions on artificial intelligence are not very strong, and all interviewees showed some reluctance to answer something concrete about the subject, so it appears that there is not a broad awareness of what the future introduction of innovation and technology and automatic systems in newsrooms.

Interviews with investigative journalists

“Hacker journalists typically adopt ethical precepts from civic hacker culture – centrally, the notions that news production should be transparent, malleable and collaborative (Lewis and Usher, 2013; Usher, 2016). Like hackers, these newswriters also display high levels of professional curiosity while regarding institutions with skepticism (Lanosga et al., 2015; Van Dalen et al., 2011). While hacker journalists on their own would appear to function as ideal data intermediaries, a pair of challenges exists in their ability to successfully translate computational knowledge to others. First, internal personnel cleavages within newsrooms can inhibit collaboration (Nielsen, 2012)” (Boyles, 2020, p. 1340).

For investigative journalists, we decided to formulate a specific interview guide adapted to this area of journalism. Therefore, its assessment and analysis will be done separately from the other interview guides. Five investigative journalists were interviewed, one of them from

the radio newsroom, three from the RTP newsroom and one from the Renascença newsroom, referenced by journalist Luís Loureiro.

Investigative Journalism Today

All the journalists interviewed mentioned that investigative journalism is a basic system of society and that, in fact, it has and has always had its importance in the current context. In a way, some refer to investigative journalism as depending on the public interest and given what is most interesting. At a given time, therefore, it fluctuates, depending on the level of public interest.

“Investigative journalism, what it often does is clearly influence the current situation” - Luís Loureiro.

“The investigation is precisely to stop the clock. And to force people to see things in a different way and to call people's attention” - Helena Lopes.

Usual Procedure for Investigative Journalism

Contrary to what happens in current journalism, investigative journalism goes beyond mere daily events and it was verified in the different interviews of investigative journalists that the usual procedure of investigative journalism begins with a denunciation. After analysing this complaint through the crossing of different sources of information and access to the different parties involved in the process, the journalists reach conclusions that will later dictate the

different procedure for each investigation. But globally, therefore, there is an analysis of the data at the office level and also a verification of the sources and a collection of information in the field, from the people who are related to the investigation. In the specific case of journalists who work or who worked for *Sexta às 9*, there is also reference, for instance, to hidden investigation methods, such as the use of cameras and photographic and videographic machines that are hidden from the interviewee and the use of captured images, in case the captured information is verified to be linked with the denunciation. Therefore, the main conclusion we reached regarding the usual procedure of investigative journalists in the universe of RTP is the existence of analysis of complaints, trying to understand whether the source of these complaints is reliable and whether the data revealed by these complaints can be used in investigative processes and in reporting publications. In the case of data journalist Rui Barros, there is an addition of information regarding investigative journalism procedure methods when he mentions, for example, the analysis and use of categories or information crossing filters that may provide more interesting data for the publication.

"Current journalism is on the cutting edge" - Eduarda Maio.

"The journalist has to be prepared for what he is going to find, so there is a high level of emotional management. It is also important to make that reservation when we only transmit the images when we know that, in fact, that is an offense that the person is doing, because then we are protected by our code of ethics" - Luís Vigário.

"For example, we did a sentiment analysis with the electoral programs in the European ones, that is, we took it in all the programs of all the parties and we used statistical methods there to recognize feelings" - Rui Barros.

Software and tools used in Investigative Journalism

Regarding the software used by investigative journalists, those who are part of the universe of RTP use basic newsroom software, such as ENPS QCut or DaletPlus. Investigative journalists also mention that they use free platforms or online software to do some part of the reporting process, as well as access to drive and other information platforms. Regarding data journalism, there is a reference to the use of Java Script and Python.

Opinion on AI and Programming in Journalism

Regarding the opinion on artificial intelligence and automation in the processes of creating investigative journalism, opinions were diverse and once again related to the type of medium used by each investigative journalist. There was a higher incidence of opinions regarding the automated procedures for organizing and selecting data, on the part of investigative journalist Luís Loureiro, regarding his participation in the *Sexta às 9* program - a timeline that could organize and make visible all data relationships in a mental or visual map that could help the journalist to think critically about the content of his investigation.

"Timelines for me are fundamental tools for investigative journalism". "If this software could distinguish these textual elements and relate them to dates, it could immediately establish a timeline of that document" - Luís Loureiro.

Chapter 5. Perception and action: flow and dynamics of the radio and television journalistic method in the digital age: surveys and questionnaires

5.6. What can we learn from data?

Generally speaking, the main conclusion we draw from the data collected at RTP is that the majority of journalists at this company have a low level of confidence in relation to the introduction of automated tools that can help in the journalist's workflow. Taking into account that *“to develop data-driven categories. The qualitative researcher uses inductive analysis, which means that categories, themes and patterns come from the data. Categories that emerge from field notes, documents and interviews are not imposed prior to data collection”* (Richards & Richards, 1994, p. 81). We can say that, firstly, this generalized notion is due to the fact that there is a fear of expansion of artificial intelligence capable of reducing, and even suppressing, more creative jobs, such as journalism and information production. With the unfolding of technological possibilities in news production, many of the processes that were analogue and processed more strenuously by journalists began to be developed by algorithms and automated tools and the introduction of technological tools in newsrooms takes some time to be assimilated into the workflow of the journalist, making it more rigid in accepting the integration of automated tools, which aim to help journalists in their work.

Since *“design-based science (DBS) is a science pedagogy in which new scientific knowledge and problem-solving skills are constructed in the context of designing artifacts”* (Fortus et al., 2005. p.855) the version construction phases the final prototype concept will be made taking into account the data collected at the North Production Centre of RTP, according

to a concrete analysis model and will be the culmination of the research based on design insofar as all the ideas obtained during the investigation will be called into question.

“In design-based research, investigations are centered around the evolution of the designed artifact. Design is the central tool for refining research questions, whether they emerge from prior literature or from the design itself” (Joseph, 2004, p.236). If we think about this notion of evolution of the designed artefact, we can also understand the need to have two different iterations, that together become a good basis for understanding the applicability of prototype idea in real scenarios. We began with structural theories in artificial intelligence and robotics, and also from investigative reporting and journalism, and understood, by participating observation the real needs of investigative journalism in Portugal. The value of our understanding over the scientific panorama allied with our scientific input relying on our ethnographic experience can be measured from the output of this thesis.

After we managed to idealize the contours of our prototype vision by taking into account all the data collected and the analysis of these data, a draft design was made with the basic elements that will integrate in the future, which can be evaluated in an intermediate way and then sketched can be passed to vector that will constitute the final version of this prototype version. Further iterations may be necessary but are not part of the work plan for this investigation. *“Design-based research that has recently emerged aiming to bridge the gap between educational research and praxis. It combines the designing of an educational artefact and research concerning the learning in the designed settings”* (Juuti and Lavonen, 2006, p.54). We believe that the best way to make this project real and tangible is through usability tests carried out and adapted to the specific profile of the investigative journalist. These usability tests are essential to align what should be integrated into the system and everything that should be discarded from the system. As Juuti and Lavonen state *“the design-based*

research process is consequently abductive employing practical reasoning” (Juuti and Lavonen, 2006, p.62) so usability tests are particularly useful for processes inherent to prototyping, so it is necessary to have a coherent test group, capable of giving structuring results for the improvement of the system. The sample idealized for usability tests will fall on investigative journalists as a primary persona and other researchers and scientists as a secondary persona. Through these tests it will be possible, through the application of a defined model with questions and tests that allow to know to what extent the prototype vision made can suppress the previously identified needs and readjust ideas that have a significant impact on the prototype idea's formulation.

“This relevance comes at a cost. First of all, design-based research is based on the idea that universality is rare in educational phenomena, and because the method takes tentative steps by first examining individual contexts, design-based researchers generalize their findings only tentatively, making this a local science” (Hoadley, 2004, p.205)

PART III

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Presentation and analysis of results

Chapter 6. *Connect-the-Dots* prototype concept

Chapter 6. *Connect-the-Dots* prototype concept

6.1. Concept definition

In general, we decided that the name of our platform would be *Connect-the-Dots* in relation to its expression as a map that allows connecting different data in a single visual space. With regard to the functional goals, we decided that it would be our intention to create functionalities that allow filtering, data organization and relationship of these data to investigative conclusions. Another feature of our platform is the possibility of visualizing these data relationships and, in general, the summary of data information in a timeline or, so to speak, in a mental and visual map that allows to understand in a conceptual way the research structure and its components and, in a more intuitive way, understand which are the most prominent relationships within the research. The *Connect-the-Dots* platform and the idea of the *DODO* algorithm are designed to be used on the desktop and an extension for mobile has also been devised.

“In the last decade, computer databases and algorithms have made their way into news organizations (Gray, Bounegru, and Chambers 2012; Lewis 2011), where they are used in particular as tools supporting journalistic investigation. With the rise of so-called “data journalism” in the United States as well as in Europe, a growing number of journalists and programmers see data-processing tools as appropriate means to uncover officials’ wrongdoings, social inequities, or environmental issues” (Parasie, 2015, p. 364). We were able to perceive a global need for the use of algorithms to help some investigative journalism tasks and this also makes us think about the role of the journalist in relation to machines and the fusion of human and artificial intelligence skills in a single process that we can call hybrid

journalism. Diakopolous notes that it is still an open question as to “*how [...] humans and algorithms [should] be blended together in order to efficiently and effectively produce news information*” – eventually leading to what he describes as hybrid journalism. *Embedding new technologies into journalistic workflows requires a design that blends algorithms with newswork*” (Lopez et al., 2022, p. 2).

The *CTD* concept emerged as a real need during participant observation in the television newsroom with the team of investigative journalists for the program *Sexta às 9*. During one of the interviews, although we already had a conceptual idea of the semi-automated platform to support production from journalism, we developed the idea by integrating the need to organize the research data of the *Sexta às 9* program, in a visual expression through a timeline capable of mapping the evidence through temporal categories and grouping by type of data. We define a non-functional prototype as a concrete representation of part or all of an interactive system. “*A prototype is a tangible artifact, not an abstract description that requires interpretation. Designers, as well as managers, developers, customers, and end users, can use these artifacts to envision and reflect on the final system*” (Beaudouin-Lafon & Mackay, 2000, p. 1007). Given the fact that “*there are many types of prototyping in practice today, but they fall under two main categories: functional and non-functional. Non-functional prototypes primarily fulfill the non-functional requirements of an application, such as look and feel. They do not enable satisfactory testing of the functional requirements and focus on design*” (Hordina, 2019). Therefore, the central concept of *CTD* is to create a platform that supports the process, i.e., the journalist's investigative thinking process through automated and semi-automated tasks in order to visually organize the data, allowing to recover, in a generic way, the time spent by journalists in time-consuming and expensive tasks.

“Prototyping is the process of developing a trial version of a system (a prototype) or its components in order to clarify the requirements of the system or to reveal critical design considerations. Prototyping can give both the engineer and the user a chance to test drive” software to ensure that it is, in fact, what the user needs” (Gordon & Bieman, 1995, p. 2).

The philosophy of the tool is to use artificial intelligence and robotics in order to help and support the journalistic actions, reaching more effective and plausible results that could not be achieved without the incorporation of artificial intelligence. *“Rapid prototypes are especially important in the early stages of design. They must be inexpensive and easy to produce because the goal is to quickly explore a wide variety of possible types of interaction and then throw them away. Note that rapid prototypes may be offline or online. Creating precise software prototypes, even if they must be reimplemented in the final version of the system, is important for detecting and fixing interaction problems”* (Beaudouin-Lafon & Mackay, 2000, p. 1009). With regard to the CTD prototype, the rapid prototyping of this system was based on data collected in participant observation, but also on data that we collected over the four years of research. Therefore, the solutions presented are the result of crossing several sources of information. And for that reason, in the future, it will be pertinent to carry out usability tests to detect problems that are not identified in the idealization of the system. We envisioned making a prototype based on the scenario so that we could take into account several factors, not just the technological features of the tool. *“Scenario-based prototypes are similar to task-oriented ones, except that they do not stress individual, independent tasks but rather follow a more realistic scenario of how the system would be used in a real-world setting”* (Beaudouin-Lafon & Mackay, 2000, p. 1013).

Chapter 6. *Connect-the-Dots* prototype concept

6.2. Comparative analysis of related applications and systems

After analyzing several support systems for the production of journalism, we can highlight the ENPS software as the basic system used in the various newsrooms of the CPN of RTP. Especially in the most recent version that can be adapted to mobile services. In comparative terms of the platforms that are being developed at a global level, we did not identify a platform strictly focused on generating investigative mind maps, but we were able to identify several platforms to support current journalists. As it is possible to verify in the analysis of the state of the art of the support platforms, identify the different systems that have structuring and content similarities in relation to the *CTD* platform.

What we can conclude from the different analyses on the various platforms that the tools available for the users in these software's are scattered, with the journalist having access to the different processes and tools that automate certain processes inherent in the usual procedure of the investigative journalist. In order to reach the final result, the *CTD* platform proposal intends to gather these tools in a single workspace.

Throughout the investigative process, we had access to different sources of information regarding platforms and software that somehow resemble the *CTD* project. In chapter two we did a more in-depth study at some platforms that have similar characteristics to our system, but throughout our investigation more information sources emerged. And more references of platforms and tools that are of interest to analyse that we will identify in this chapter very

briefly, just to update the list of tools and platforms that somehow cross the objectives of our support system for investigative journalism.

ENPS

The ENPS is a system developed by Associated Press to provide an informative database, of high value to the journalist, which is capable of crossing different news agencies and different sources of information in a single space. This platform emerged from our participant observation in RTP and we believe that it is a renowned software among portuguese journalists and should be taken into account as a credible information database. The idea of this database can be replicated in our system.

New York times Bryant Park face recognition

This platform could be a base reference for investigative journalism and the automation tools associated with the *Connect-the-Dots* system due to the fact that this platform allows facial recognition through analysis of images from public surveillance cameras and widespread access on the Internet. This tool could be interesting and can be applied in our system from the point of view of sensitive investigations in which it is necessary to look for a certain individual, or even recognize the location of people at a certain time for data verification.

Jigsaw visualization for investigative analysis

So far, Jigsaw Visualization is the tool with the most similarities with the *CTD* Platform. This Platform allows you to perform visual analyses and explore relationships between documents and document collections in a visual way. It is a tool that must be taken into account when

designing the *CTD* Platform, as it can allow the platform to be enriched and also allow to reduce some time spent in analysing the tools necessary for investigative journalism. It is therefore an interesting platform for this project and should be highlighted.

Muck racker

Muck Racker presents itself as a platform for use by journalists based on the database that allows agglomerating various fields of information of journalistic interest. This is a platform that should have been taken into account with regard to the inclusion of universal databases that allow a greater reach of investigative journalism on digital platforms.

Chapter 6. *Connect-the-Dots* prototype concept

6.3. Inspirational tools and open-source possibilities

As mentioned in the previous section, both the *CTD* platform and the development of the algorithm foresee the integration of open-source tools and the use of open-source projects, in order to take advantage of all the scientific and empirical knowledge, so that there can be a re-use of the tools that are available for integration into backend development. During all the investigation time, dedicated to understanding what kind of tools have already been developed by different entities and that can be integrated into the *CTD* project, we managed to arrive at a significant list of tools that have the same empirical character as some of the tools we idealized. We can say that most of the identified tools are related to task automation processes and the creation of informative and visual contents through artificial intelligence.

During the process we considered the tools that would be useful and necessary for a better performance of the investigative journalist in information projects. In this sense, open-source solutions or tools that are freely available for integration into systems, would help to create a project capable of reusing work already carried out by other researchers and designers. The following table shows all the tools that were inspiring for the *Connect-the-Dots* proposal and that can be integrated in a future project.

Table 2

Inspirational tools

Source	What it means to investigation	Inspired to	Notes
Jenni.ai	It's a platform that allows you to construct phrases, having a human input as reference	Creating textual content of visual timelines	Look for possible open-source alternatives
Wordtune.com	Rearrange phrasal structure from human input	Writing text (paraphrasing)	We can see how to integrate this tool in <i>CTD</i>
Consensus.app	Platform which helps to find scientific articles by providing a summary paragraph about the article	Reference for sharing leads into visual timeline	
Microphone Fn(2xtimes)	Transcribing interviews	Helpful for assistant – voice input for comments	

Texti.app (extension chrome)	Helps by answering hypothetical questions you type	Assistant can propose ideas of investigation, can also identify directions of research	
LAB-SAFE (ICFJ)	Planning, drafting, writing, coding, presentation, communication, exchange of experiences with reporter and editor	Safe online tool Safe chat Accidental loss of data	
Datajournalism.com	Free resources materials Online videos and community forums	How to apply data journalism in investigative process	
Lidar	Method for determining ranges by targeting ion object or a surface with laser and measuring the time for the reflective light return to the receiver	3D laser scanning High resolution maps	How could it apply to field research?
Excelformulabot.com	Transform your text instructions into excel	Create formulas to help journalists organize data	How could this be integrated on prototype?

	formulas in seconds with help of AI		
Quillbot.com	Quillbot will rewrite your text	Paraphrasing content – content maps visualization	
Kamerke Osint Tool	Opensource intelligence gathering tool that indexes information about sensitive internet- connected devices and post this approximate location on map	Help investigative journalist in field; Show path during investigation	
Hyperwriteai.com	HyperWrite provides suggestions and sentence completions to improve your writing, whenever you write	Platform suggestion of investigative hypothesis; Beat writers block	
Frase.io	Create content briefs in minutes, not hours Generation of content Content analysis	Statistical data analysis – visual maps	

One-tab.com	Convert your tabs to a list and speed up Firefox	Make journalists search into a list to help journalists think	
Hemingwayapp.com	Level of readability Automatic analysis of various generational parameters	Make analysis of journalist input in platform	
Mockupbro.com	Create free mockup without the software need	It might be interesting to create visual expressions in the <i>CTD</i> platform	
Openai.com/ Dall-e-2	Dalle-2 can create original realistic images and art from a text description combine concepts, attributes and styles	It can be used to generate hypothetical scenarios in order to help in research. It could give a reference image about the investigation.	Propose timeline visualization
The follower	Using open cameras and AI to find where a Instagram photo is taken; Record a selection of open cameras:	Helpful input for the mobile version or for desktop version to follow some people during investigations	

	Software compares the Instagram with the recorded footage		
Uizard.io	Design prototypes in minutes : Visualize and communicate your ideas effortlessly	Drawing timelines	
Womp 3D (alpha.womp3d.com)	Tool capable of generating 3D images from scratch	Making visual expression of data Icon research	
Eileik Robot	Robot a higher level of emotional interactions between human and robots. Responds to touch	Countdown timer; Pomodoro timer; 10s stop watch;	
Haikei.app	Generate unique SVG design assets	Generation backgrounds	
Colouring photos	Photoshop function to colour black and white photos	Helpful for giving more expression to content	
Videocreek.com	Provide videos and tools	To create gifts used in the visual map	

Deepbrain.ai	Revolutionary text to video production	Virtual self/expression of journalist	
Autodraw.com	Generator of high-quality image over a human input	Creation of buttons Integrate option input drawing	
Inkscape.org	Free open-source compared to Illustrator	Designing	
123apps.com	Website that integrates different tools for editing	Use the specific journalist tools	
Plask.ai	Generates 3D videos from real videos	Algorithm express emotions; Simulation promote prototype	
Kaedin3d.com	Turn 2D images to 3D	Helps to create 3D representation of scenarios	
Thenounproject.com/ google fonts	Creation of vectorial icons and other typos	Prototyping Infographics and visual maps; Visualize investigation	

Products.ls.graphics/ mush.gradients/	Gradients to use in the prototype	Output of investigative information	
Lordicon.com	Helpful creating animated icons that must be highlighted	Highlight icon that should be clicked; Highlight something in investigation	
Studyum.store	Generates 3D icons	Could be used on making logos; Could be used on specific icons to be highlighted	
Otter.ai	Capture and share insights from your meetings	Could be used to capture textual insights from remote interviews	

Chapter 6. *Connect-the-Dots* prototype concept

6.4. Dashboard

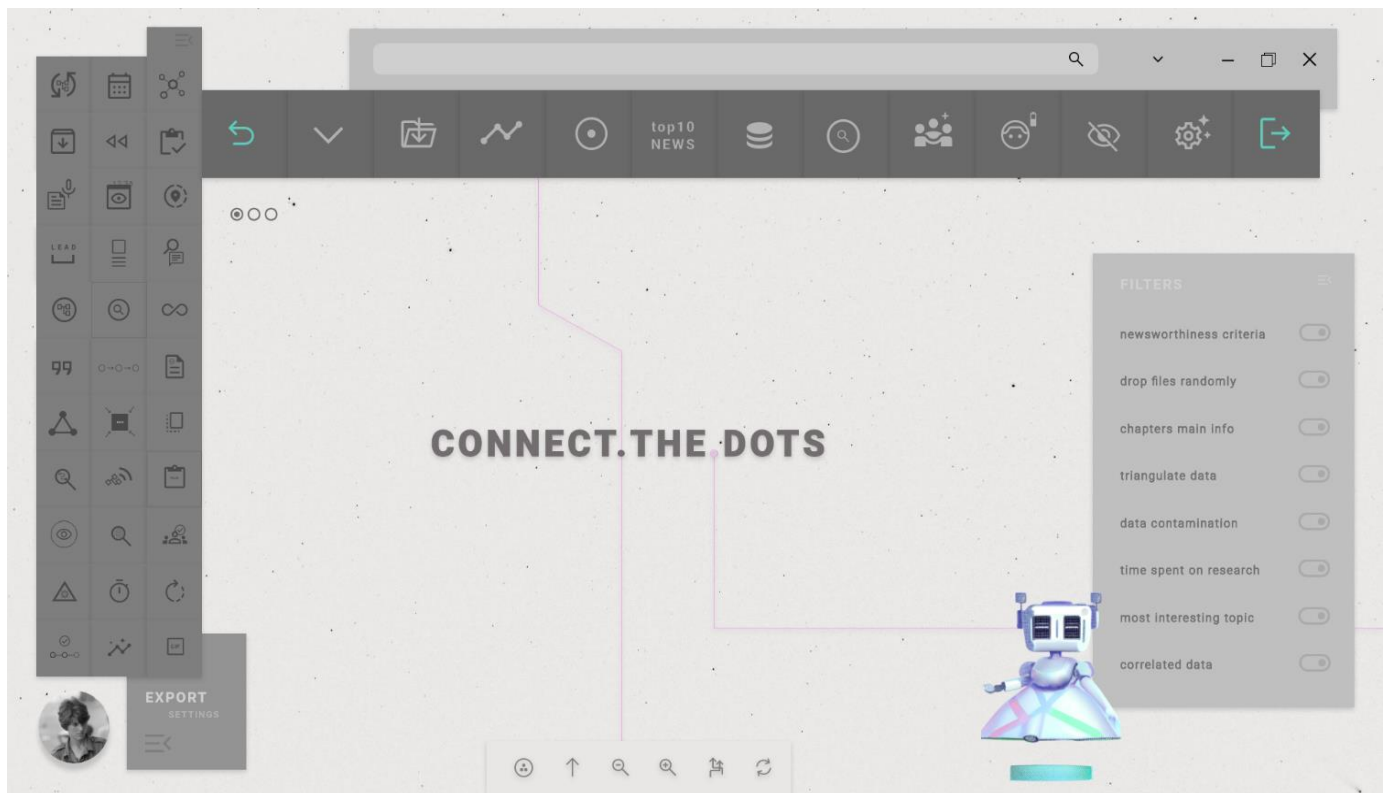


Figure 11 - High Fidelity Homepage Prototype

“The goal is the same as other brainstorming exercises: to create as many new ideas as possible, without critiquing them. The use of video, combined with paper or cardboard mock-ups, encourages participants to actively experience the details of the interaction and to understand each idea from the perspective of the user” (Beaudouin-Lafon & Mackay, 2000, p. 1011).

As shown in the image of the *mockup* created, we will explain in more detail each part of the non-functional prototype, namely the tool clusters, which are clearly distinguished by their positioning on the screen and in the workspace idealized for the Connect-the-platform. Dots. In the central part is the space idealized for the presentation of the visual map and timeline related to the research project. At the bottom of the screen, we present the tools to interact with the timeline. On the right side are expressed the fields in which the user can choose the filters by which he wants to organize the data. At the top, you can check the search bar in a generic way, and the main buttons, chosen by the user, which represent the tools most used by the user in the projects. On the left side, all the system tools not included in the main menu are displayed, as well as the tab to choose the specifics of the output file.

The dashboard idealized for the *CTD* platform, is related to the ideal combination of all the tools in the same workspace allowing the investigative journalist and other researchers to have access to everything needed to study and investigate a specific subject. In this way, the dashboard will consist of numerous buttons grouped on different boards, each with a specific purpose. The buttons will be grouped according to their functionality.

There will be some informative boards about data and metadata related to the research project. The most central part of the dashboard will be occupied by the visual expression of the investigation timeline or visual map. By visualizing the data in a creative way, the *CTD* will allow the interaction between journalists and the timeline to obtain more specific information. Increasing and decreasing a detail of the timeline will also be allowed such as to delete unwanted items. The dashboard structure will include the following features.



Figure 12 - Main buttons of CTD homepage

Summarize

Description:

This functionality will make it possible to reduce the content of some text or document, so that, in a paragraph or two, there is the main information about that document or about that text.

Goal:

This functionality is very significant in the management of the *Connect-the-Dots* system in the sense that it will allow you to create small paragraphs that can later be used to visualize data on the timeline.

Data protection

Description:

This functionality will allow the journalist to work on two layers, that is, imagining that the software is processing, categorizing, or even analysing large collections of data, there will be the possibility for the journalist to activate a possibility, for the system to hide it for that matter say the work being done by the use of an image or some kind of widget that can be used to mask the program and the features of that program.

Goal:

This feature is useful if the journalist is dealing with sensitive issues and by clicking a keyboard or mouse button, he can hide the work from people who may appear. This is important because, as we already know, investigative journalism deals with sensitive subjects and content that cannot always be viewed by children or people who cannot recognize the identity of the people being investigated.

Find evidence

Description:

In this resource, the journalist will be able to find specific data that he wants to find in a large collection of information, for example, a term, a phrase, a number or a clipping of an image, everything that the journalist would like to find in a file or in a group of files.

Goal:

The goal of this tool is to find evidence or data related to what journalists wants to know, in a quicker way.

Time spent on work

Description:

This functionality will allow informing the journalist how long he has been working on a given subject, in order to obtain broad information about his experience with the software. It is a unique reference of the time spent in the software.

Goal:

This functionality aims to inform the journalists or the researcher how many time he has spent on work, fiving insight about data relevant to monitor health patterns.

Vision board

Description:

In this space, the visual timeline will be expressed, the mental map of the entire investigation or the analysis parameters that the journalist prefers – such as “I would like to see it explained in infographics or in a relational timeline”. Therefore, it is a space that will allow different types of visualization or templates for visualization of the timeline.

Goal:

The vision board is the main area of the platform, allowing the journalist to interpret data and the link relating different kind of information.

Timeline in layers

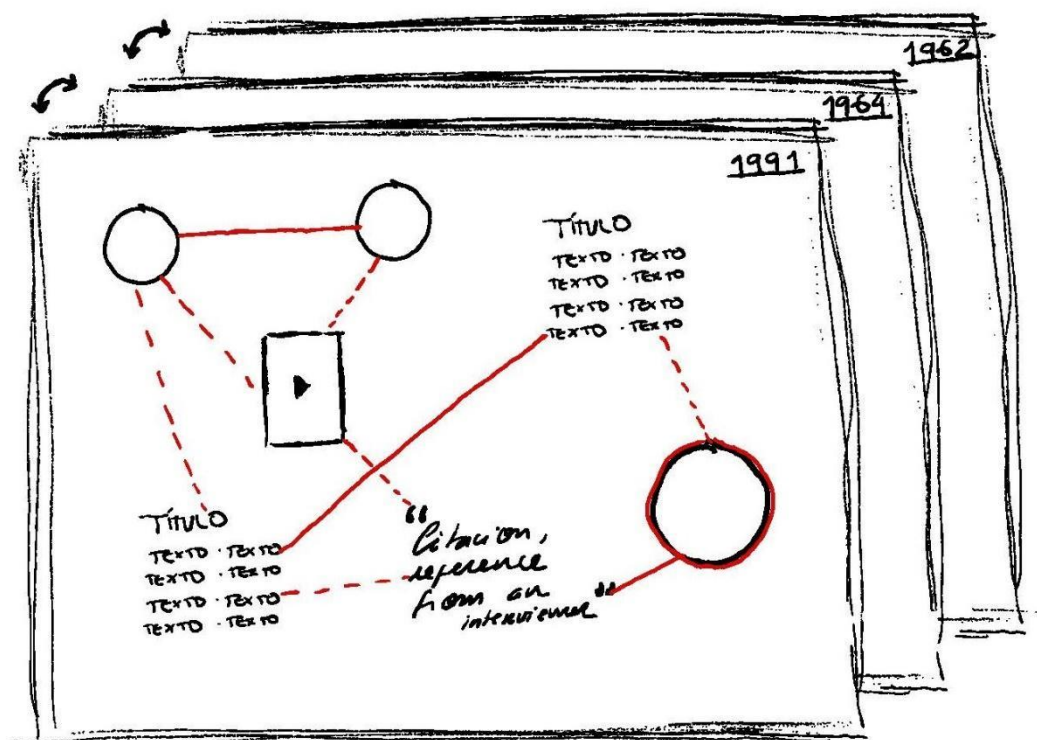


Figure 13 - Timeline layers organized by year

Description:

If the timeline is displayed in relation to the categories or parameters selected in the data list, there may be the possibility of viewing the timeline data from a perspective of a vertical timeline or in layers, where it is possible to change, for instance, the year of data visualization. Namely the data referring to the year 2010, and another layer referring to the data from 2011, therefore, they are two different perspectives of data relation. We can talk here about a three-dimensional timeline.

Goal:

This tool might allow the journalist to see different types of relations between data, from the chronological perspective, giving a direct possibility of altering between different layers.

List of sources

Description:

This feature will display a list of sources and contacts and other types of information that the journalist can use to expand his field of action.

Goal:

The goal is to have access to contacts of experts and people of interest to be interviewed. It is a board defined solely for this type of information.

Lead creator

Description:

This feature will allow, like the summarize tool, to create smaller groups of data that have the same information as larger groups of data. In this case, this functionality will create the possibility of analysing documents and files or texts and reducing them to a single sentence.

Goal:

This functionality will be predominant once again for the integration of the visual timeline. Especially with regard to infographics within the mind map.

External databases

Description:

This functionality will allow access to different public and private governmental and non-governmental databases that want to collaborate with the *CTD* project. In this way, the journalist will be able to include access to this database in a global search that he wants to do in the *CTD* space.

Goal:

The main goal of this tool is crossing data from open data silos (governmental data bases, document leaks, www, some aspects of *darkweb*, large net of information available to investigative journalists through this platform).

Round profile photo

Description:

The profile photo will allow automatic access to the profile of the investigative journalist in question and all the specifics relating to the user's profile. These specificities will be predominant in the type of interface and buttons displayed for each journalist.

Goal:

Have a direct access to profile options.

Location icon

Description:

This button will allow journalists to access the location functionalities, that is, if the journalist does not want to be identified in his location, this is a button that allows him to make changes in this regard.

Goal:

Identify if the location of the journalists is being monitored, giving the possibility to hide his position through GPS and internet satellites.

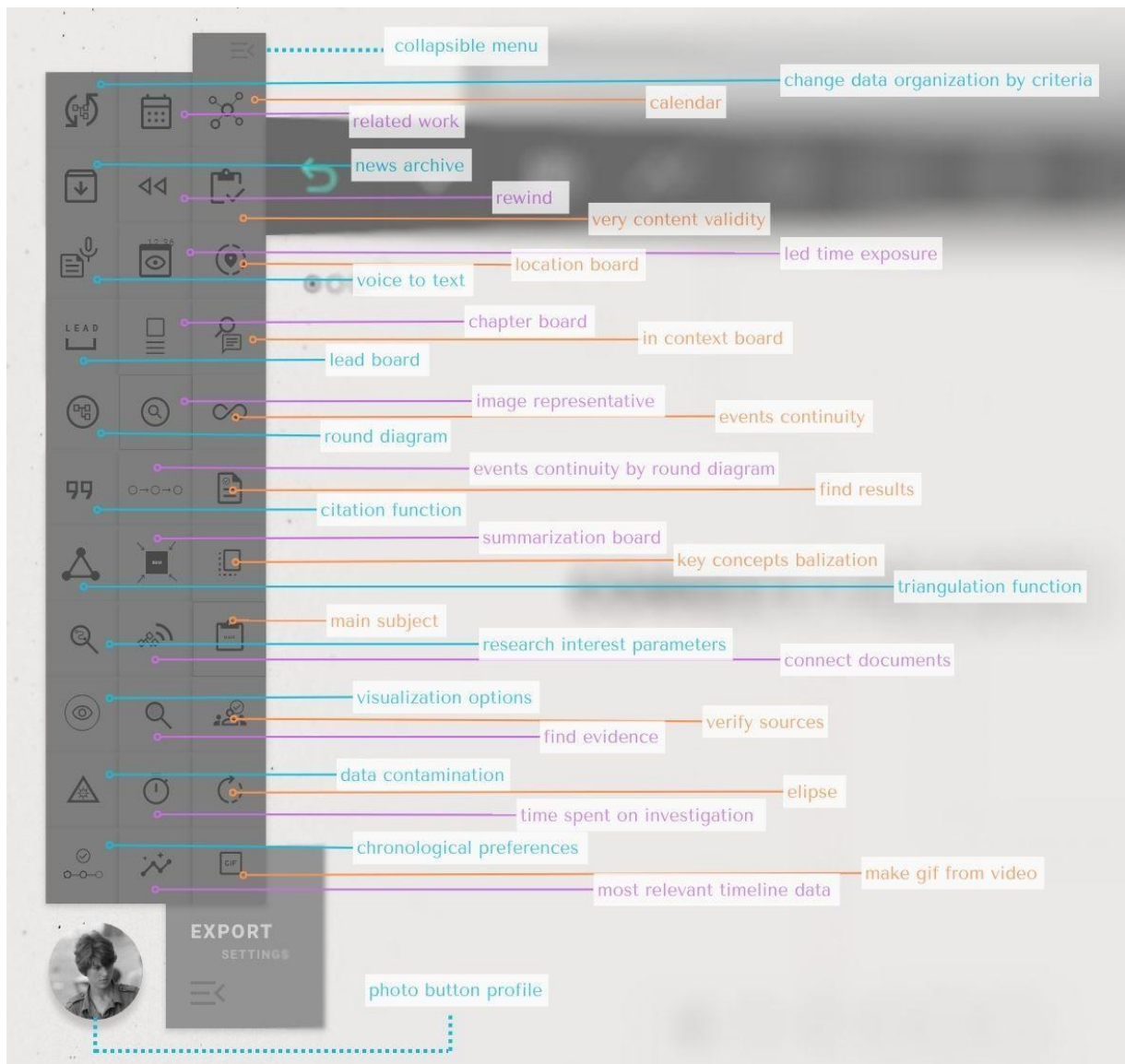


Figure 14 - functions and tools associated to CTD concept

Icon “tzimtzum” (heart of the matter)

Description:

This icon will specify to the journalist what the central subject of the investigation is - what is the core of the investigation.

Goal:

Give an option fully automated to discover the heart of the matter by analysis of all the data in order to reach the central point of the issue to be addressed.

Calendar icon/board

Description:

In this button, the journalist will have access to the annual calendar and thus can reference or link data depending on the date and time reference. This could also be a way of looking for data through its reference in temporal terms.

Goal:

Give the possibility to the journalist to find data related to a specific date in time.

Help button

Description:

This button will be related directly to the *DODO* assistant. When the journalist needs automatic and immediate help, he can click on this button which will go directly to the text box in which the journalist will specify what he needs to be helped with.

Goal:

Give opportunity to the journalist to work with *DODO* assistant and work with the results, in an easier and more intuitive way.

Logout button

Description:

In this button, the journalist will no longer be logged in, that is, there will no longer be a connection with his data and with his project archive.

Goal:

Have a quicker way to disconnect to all data and projects associated to the account.

Board “see also this (related work)”

Description:

On this journalist board you will access works, or scientific articles that are related to the research topic.

Goal:

Allowing to cross database in relation to articles and bibliographical references.

File button

Description:

In this button, the journalist will have access to his project archive, that is, all the research projects that he has already created on the platform and, therefore, he will have a personal library where he can manage his files.

Goal:

Have direct access to all projects stored in the platform.

Search bar

Description:

This search bar will work like Google search, in which the journalist will be able to search in a database, related to the internet or also if he wants to include governmental or non-governmental databases, he will be able to make a search through this bar, specifying what kind of database do you want to analyse.

Goal:

Have a direct and easy way to find something by writing key words or association of words.

Back button

Description:

This button will allow the journalist or researcher to go back through the steps they have taken in the system.

Goal:

Have a quick way to undo some tasks.

System Options button

Description:

In this option, the user will be able to access tools and system options, where he will be able to define and identify which parameters he prefers to define for the system.

Goal:

Have a direct way to access to the options panel, to define the characteristics of the platform.

People of Interest Board

Description:

This board will indicate people of interest and sources of information that the journalist can contact.

Goal:

Make new data relationships, identify experts and other people who may be interesting for the investigation.

Extensive menu

Description:

Some menus will be extendable/collapsible, that is, they will have a smaller icon that, when clicked, expands and provides more options.

Goal:

Allow a cleaner viewing screen and less visual noise in the investigation processes.

Activate a requirement

Description:

In the dashboard it will be possible to activate or deactivate certain functionalities in the act of investigation.

Goal:

Permit for greater fluidity in the choice of options that the journalist wants to be included in the investigation and project.

Board with the top 10 news

Description:

On this board, the journalist will have access to the 10 most important news items of the day, which will be tailored according to preferences and newsworthiness criteria, which the journalist will place in the system options.

Goal:

Have a source, of the constantly updated news in the platform.

Board about the person/group under investigation

Description:

If the investigation is focused on a person or a group of people who are constantly updated on social networks.

Goal:

This board will link to a certain website or digital platform and will allow the updating of data regarding the publications of these people or groups.

Manual data organization

Description:

This option will allow the journalist to rectify specific analysis parameters and evaluation criteria in detail. It will be a very detailed option that requires some level of programming.

Goal:

The journalist will have the option to customize the relation between data from a coding perspective.

Voice to text notes button

Description:

This feature will allow the journalist to write through voice commands or through text narration through the microphone, which will be instantly translated into text.

Goal:

Having the opportunity to insert data in the platform in an easier way.

Board database - big data

Description:

On this board, the journalist will have access to governmental and non-governmental databases at a global level.

Goal:

If possible, this tool will aggregate different databases in the same place in order to be possible to search for data within these databases.

Board mode normal or hidden

Description:

On this journalist board, you will identify whether you want the session to be anonymous or recognized with the user profile.

Goal:

This allows the journalist to carry out investigations that are not recorded at the data level, as with other platforms that allow anonymous use.

Time blue leds

Description:

As Green et al. (2017) explains “*exposure to SWL-illumination from computer screens disrupts sleep continuity and quality. Specifically, this type of light exposure lengthened sleep latency, reduced sleep duration, increased the number of nocturnal awakenings and time awake at night, and decreased sleep efficiency*”. Taking this information into account we envision that this specific feature will inform the journalist how long he is exposed to the LED lights.

Goal:

To allow making conclusions about the physical and retinal health of the eye, regarding exaggerated exposure to LED lights.

LOGIN

Fingerprint analysis

Description:

To log in or to enter the system, there will initially be a form of identity validation through fingerprint recognition, as is the case on some digital platforms and mobile phones.

Goal:

Login to the desktop via the mobile connection, or by entering a specific user code.

News Archive

Description:

On this board, the journalist will have direct access to his files that will be placed as a reference at the beginning of the session, as a suggestion to enter the document.

Goal:

Give the journalist the opportunity to access directly the project in the historical list.

“Machines could process large amounts of data on journalists’ behalf and raise red flags for journalists to further investigate and decide on. By using such a funnel approach, journalists are able to dedicate their precious time to the most suspect of cases and machines are able to save journalists the time and labour

of winnowing from the field various low-risk images”. (Thomson et al., 2022, p. 956)

Chapter 6. *Connect-the-Dots* prototype concept

6.5. Filters

As “*sorting or categorization is the process of ordering empirical observations with regard to their similarity (or dissimilarity). The function of categorization in the research process is to sort empirical phenomena according to rules that are believed to relate to a specific research question*” (Bergman & Coxon, 2005, p. 12). The most important filters related to the data displayed on the timeline will be incorporated into the dashboard so that the journalist can filter the displayed information in a faster and more intuitive way. More complex filters will be displayed in a pop-up window where the journalist can choose and determine what kind of parameters the journalist wants to filter. “*As with database journalism, one could draw from the name “data-driven” that we describe a subcategory of (technological?) journalism here. In cases such as Wikileaks, large datasets arrive before any journalistic hypothesis or story idea is in place, and the process of analysing the data drives the journalists towards a story they had no chance of knowing of before the data arrived. It becomes a “follow the money” or “follow the evidence” kind of game through datasets. This too seems not to be the case; these terms are used interchangeably*” (Stavelin, 2013, p. 34).

As stated by Ocaña & Opdahl (2022, p. 4) journalists spend a lot of their time monitoring and filtering large volumes of news feeds like TV broadcasts, radio shows, social media and published news to keep them up-to -date, time that otherwise would have been invested in producing news. Today’s worldwide daily news volumes scale over 100,000 articles making it unfeasible for journalists to manually handle tasks like fact-checking and searching for related articles. In this case, the use of filters may be preponderant insofar as it

allows incorporating these data validation possibilities. *“Fact-checking, source-checking, verification, and debunking have long been journalistic practices; however, when faced with the firehose of user-generated content online, these seem to fall by the wayside more than they should, especially when it comes to visuals”* (Thomson et al., 2022, p. 957).

The displayed information, according to the selected filters, is extremely important to help the system create and learn what is really important and what should be discarded in relation to the investigation. This is because in a research project it might be interesting to find data related to prompt terms, but in other investigations, it might be important to find all the data that were created in the same year and group them visually on the timeline. The functionality of the filters will therefore be a decisive tool for the quality of the visual maps created by the *CTD* system. *“Journalists can automate many tasks that make up news production – such as detecting or verifying data, producing graphics, publishing with selected filters and automatically tagging articles”* (Lopez et al., 2022, p. 2). We anticipate that our system will have the following filters:

Parameters of research interest

Description:

In this category, the journalist will determine the parameters that he thinks are most interesting for research.

Goal:

This will allow to select the values the system will be based on to perform the analysis and interpretation of the data.

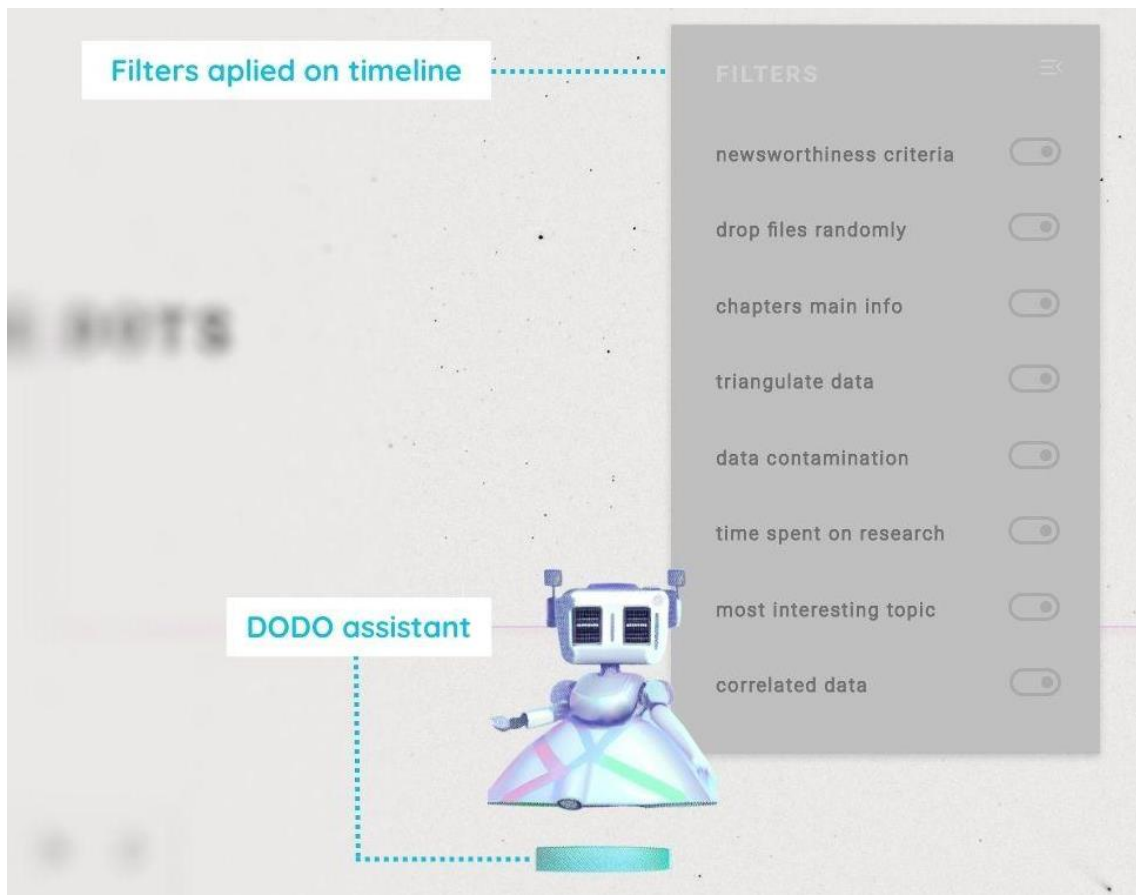


Figure 15 - filters associated to the timeline and DODO assistant

Drop (no filter) random chaos

Description:

In this feature, the journalist will be able to upload several indiscriminate files, without any type of categorization or evaluation parameters.

Goal:

Place the data in a chaotic way, in order to find associations that were, somehow, hidden by the associations made by the platform.

Documented highlighted and connected

Description:

This feature will highlight the words, images or sounds that are most decisive, according to research and evaluation of the data, therefore, they will be highlighted in comparison with the rest of the data.

Goal:

Highlight the data and make relationships that will be expressed by a visualization connecting them.

Set board chapters with main info

Description:

This functionality will group the most relevant chapters of the research analysis.

Goal:

Create chapters of interest depending on the research analysis and will include the most relevant information about that evaluation.

View options (visual storytelling)

Description:

This functionality will allow the journalist to choose which type of template he wants to see when viewing the data, that is, what is the intended design, the art style he prefers to see the relationship between the data and, thus, create a visual narrative or a mind map.

Goal:

Give opportunity to the journalist to select the way he wants to see the data visualization.

Board triangulate data

Description:

In this functionality, the journalist will determine what types of categories or what types of relationships he wants to be related in the data triangulation.

Goal:

Determine, for instance, a specific location, a name of a detailed person, the name of an organization and try to find data on these three intersecting categories.

Board search for evidence

Description:

This functionality will allow the journalist to find clues and traces of some information related to what he wants to look for.

Goal:

Allow to find research clues that are in various documents, files or data.

Type statement

Description:

In this functionality, the journalist will give a command to the platform to perform a certain function.

Goal:

The journalist can write a prompt or some command that directly directs the platform to the intended result.

Select type of data

Description:

This feature will allow the journalist to select which types of data he wants to analyse.

Goal:

Select which type of data to analyse such as textual data, image data, sound, or other types of files.

Verification of sources

Description:

This functionality will allow the journalist to verify his sources or any type of data that he wants to do fact checking.

Goal:

Understand if what is being said or referenced is true.

Data contamination

Description:

In this functionality, the journalist will see if the data included in the investigation are contaminated in any way.

Goal:

Rank these data in relation to others that are more reliable.

Assistant newsworthiness parameters

Description:

It is important to note that both the *CTD* platform and the *DODO* Assistant will include the most relevant newsworthiness criteria for an investigative journalist.

Goal:

The platform will include the following newsworthiness parameters, which will also act as a filter for what is considered news, and for what should be discarded:

1. Failure
2. Mega event

3. Relevance
4. News
5. The amount
6. Unexpected
7. The death
8. Conflict
9. Excess/scarcity

Chapter 6. *Connect-the-Dots* prototype concept

6.6. Timeline

“We live in a world in which it is increasingly important to understand complex socio-economic and ecological phenomena to facilitate well-informed decisions. Journalists play an important role in this endeavour by uncovering hidden patterns and relationships to inform, enlighten and entertain” (Stoiber et al., 2019, p. 700). In this way, visual expression can emphasize these information relationships. The visual expression of the timeline is the central tool of the *CTD* system. So that it is the central support for investigative journalists and other researchers, so that they can, in a broad and global way, find basic research information that needs to be studied in its context. *“Visual mis/disinformation is proliferating and journalists are often complicit in amplifying visual information with unknown provenance and unknown accuracy”* (Thomson et al., 2022, p. 938). *CTD* focuses on reducing the time spent by the investigative journalist on data analysis, as well as generating a mental map that allows a better understanding of the different relationships between different data.

“The structured processes characteristic of atomised approaches to news can provide more choice for audiences but require journalists to “write for machines” by inscribing inflexible structure as well as delegate elements of control to computational processes” (Jones & Jones, 2019, p. 1175).

Bearing in mind that *“organizing categories hierarchically has powerful consequences. For one thing, the hierarchies tend to constrain the meaning of a given category”* (Richards & Richards, 1994, p. 83) it is important to note that the different font sizes, images and icons as referenced in part one, have a proportional difference concerning the importance of data for the results that the journalist aspires to achieve through the ongoing investigation. The timeline is the maximum expression of the relations between the data that changes according to the parameters indicated in the filters. There will be different display themes. *“Rapid advances in digital, networked and Internet-enabled technologies have led to vastly increased capacity for creating, capturing, storing, and distributing information as data. This expanded capacity has in turn fostered momentum behind innovation that exploits data. In journalism, a related area of experimentation that has been gradually gaining traction is the “atomisation” of news, in which a story is broken down into “atoms” of information, which are abstracted and represented as data. These many atoms (also sometimes called objects, units or components) can then be used multiple times in multiple ways to build and rebuild different hybrid stories”* (Jones & Jones, 2019, p. 1157). Based on this notion of “atomization of news”, we decided to outline different specificities for data visualization:

Board title of investigation

Description:

On the Timeline, one of the objects that will be identified is the title of the investigation that will be in a visible size and that can be recognized at a first glance.

Goal:

To highlight the main idea or issue about the visual board.

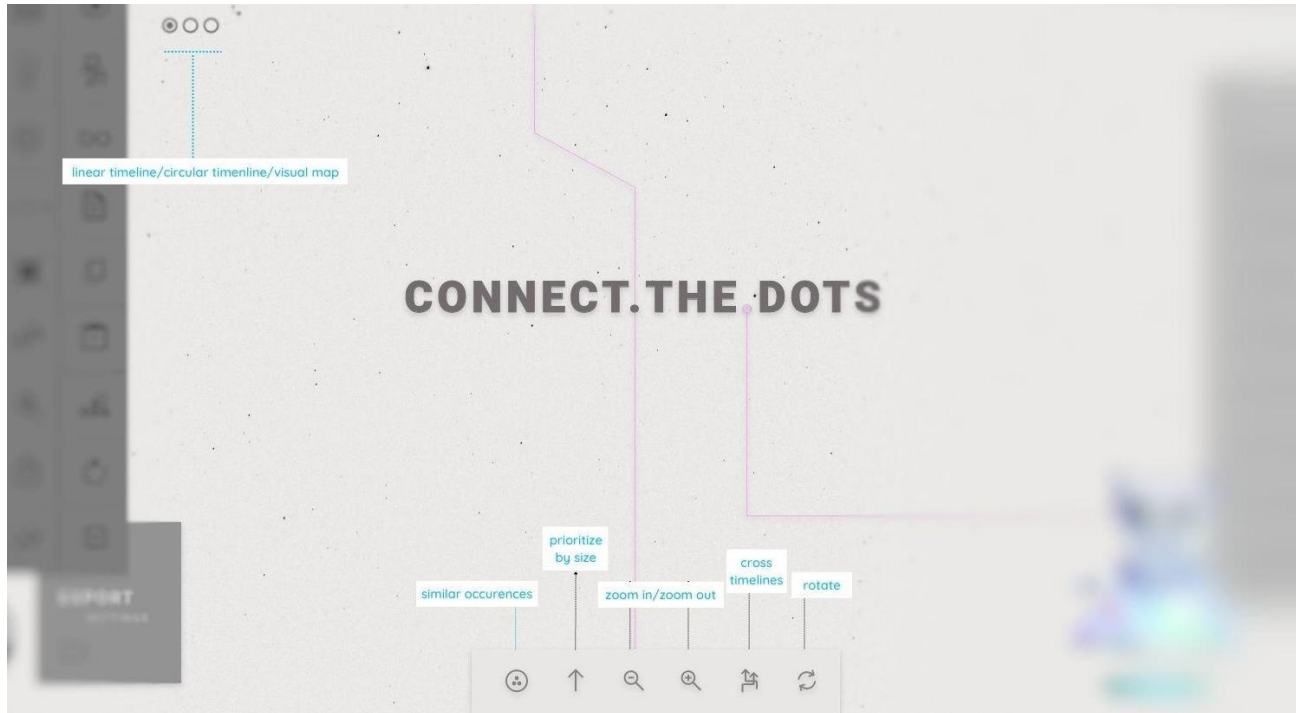


Figure 16 - tools and buttons directly associated with timeline

Board wheel timeline

Description:

This button will allow changing the type of data visualization. Data visualization is usually linear, a linear timeline, but if the journalist wants it, it can be a round timeline.

Goal:

Give the possibility of the journalist to change the way chronology is presented, altering from linear to circular presentation.

Chronological selection board

Description:

This functionality will allow the journalist to select which data he wants to relate chronologically, so there may be some fluidity in the search in temporal terms.

Goal:

To relate specific data from a chronological point of view.

Points on the timeline wheel (most important topics)

Description:

With regard to the wheel-shaped timeline, it will allow highlighting some reference points of the investigation, that is, some highlights where the journalist can understand, at a first glance, which are the most important topics related to the investigation.

Goal:

Turn more visible some aspects that need to be highlighted in the process of investigation.

Waiting panel

Description:

This panel will inform about the status of a functionality or a process, in the system that is still running, that is, it is a waiting panel.

Goal:

Have a visualization to inform about the current state of investigation.

Two-way arrow icon

Description:

These functionalities will allow you to move forward or backward in the processes carried out within the system.

Goal:

Have more flexibility in the processes of investigation.

Specific chart

Description:

This feature will allow the journalist to access a specific graph and understand, in more detail, some aspects of the data or parameters included with the data.

Goal:

Give the opportunity to reflect the relation between data through a visualization.

Importance size photo icons

Description:

This button will allow the journalist to know which are the most important data or the most relevant data in the investigation.

Goal:

Arrangement of icons and images in a size proportional to their importance.

Menu for investigation chapter

Description:

This extensible menu will refer to the main topics or chapters of the investigation in which the journalist will be able, through this system, to access exactly the chapter or part of the investigation that he wants to deal with.

Goal:

Give opportunity to give a cleaner ware to work.

Small round chart on highlighted data

Description:

In the data with greater emphasis during the investigation, it may be possible to make a visual expression of certain information.

Goal:

Create a round icon with reference to some image or some icon that represents the type of information that is being treated.

Most important video gifs

Description:

If there is video evaluation, it will be allowed to include GIFs of the parts of the videos that are most important for the investigation.

Goal:

These videos will be played in a loop, given the characteristics of the GIF and this will allow the journalist to emphasize a certain moment or a certain subject that he is dealing with in that video.

Chapters in round timeline strokes

Description:

It will also be possible to understand, in a round timeline, what is the extension of a subject in temporal terms.

Goal:

The extension of the wheel's line will be proportional to the event, seen in a temporal perspective.

Data visualization button

Description:

On this button, the journalist will have access to more specific data visualization functionalities.

Goal:

Have access to iconographies, semiotic analyses or other types of interpretations that are linked to the visual map.

Triangulate data button (sample to find similar occurrences)

Description:

This button will allow the journalist to identify which data to be analysed is that he wants to understand if there are similar occurrences.

Goal:

Identify which data he wants to understand if they exist elsewhere or in another file or in other data.

Button to change timeline style

Description:

This button will allow the journalist to change the data visualization style in a faster and more intuitive way.

Goal:

The journalist can automatically and quickly change the type of visualization in three different formats.

Button to cross timelines

Description:

If there are several timelines, this button will allow you to cross information between timelines. This will allow greater specificity in the data relation.

Goal:

Give possibility to the journalists to cross information from different projects.

Zoom in zoom out button

Description:

This button will allow you to increase or decrease the size of the data and the visualization of the data.

Goal:

Give more fluidity to the data visualized on the board.

Function group by classification

Description:

This functionality will allow you to group certain data according to a defined classification, which can be determined in the filters or through this button.

Goal:

This goal aims to associate data from a category point a view.

Link function by record

Description:

In this function the user will be able to link the data through a link or a link visible as a red line between the data. This is the main expression that gives the *Connect-the-Dots* system its name.

Goal:

Give visual expression to the relation between data.

Chapter 6. *Connect-the-Dots* prototype concept

6.7. *DODO* Assistant

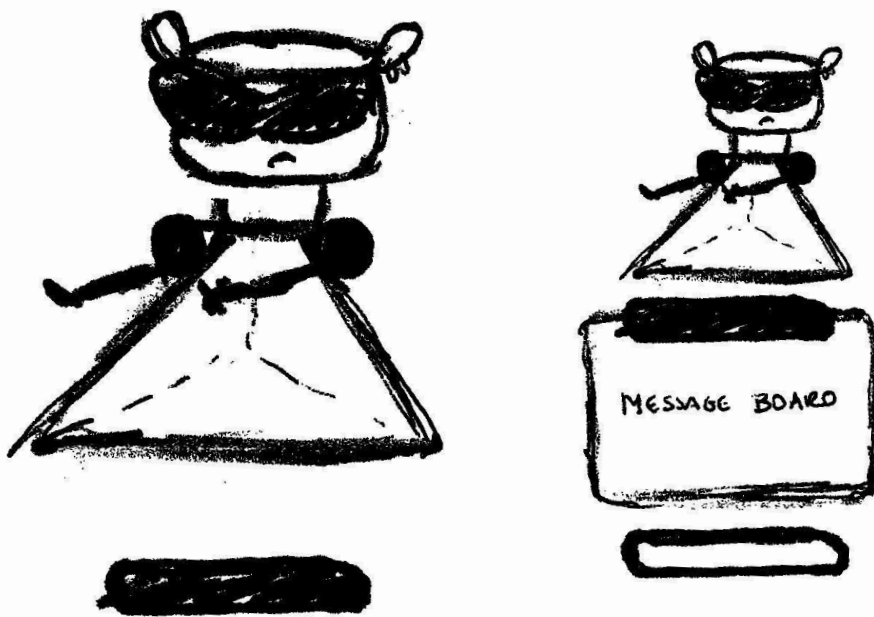


Figure 17 - Sketch of the visual representation of the *DODO* Assistant.

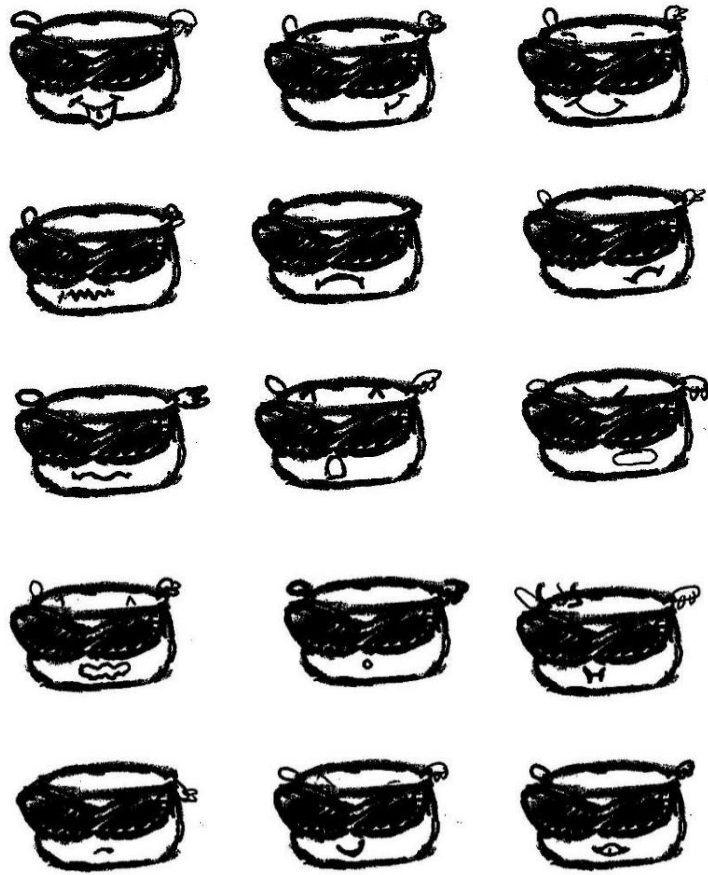


Figure 18 - Sketch of the emotions represented by DODO to interact with the journalist.

“Our findings indicate that framing chatbots using anthropomorphic explanations can impact how users perceive and search news via chatbots. Perceived humanness has a significant impact on the users’ willingness to interact with chatbots and has notable consequences for user’s beliefs and behaviours” (Shin, 2022, p. 2696).

Our proposal for the *DODO* assistant arises from the need to guide the work of an investigative journalist in the context of helping the journalist and maintaining and increasing his mental health, often associated with strenuous work on sensitive topics related to investigative journalism, especially after the influence of the COVID-19 phenomenon on the global state of health. *“Similarly, the datasets used for machine learning need to become more representative in order to become more useful in journalistic and public communications contexts. For example, much of the data in machine learning training sets are themselves computer-generated or drawn from only a very narrow slice of publicly available imagery”* (Thomson et al., 2022, p. 958). Given this increasing use of automated tools in society, we feel a greater relevance of influence and use of artificial intelligence in order to help the journalist to maintain the basic parameters to reach the maximum cognitive efficiency during the journalist's workflow, therefore, the *DODO* assistant will be responsible for notifying journalists of characteristics to increase or at least maintain cognitive efficiency and, in a second phase, automatically suggest paths for investigation and an alternative way of seeing the data, suggesting new data collection through fieldwork, we believe that this assistant may have a physical expression as a robot.

““Prototypes” are representations of a design made before final artifacts exist. They are created to inform both design process and design decisions. They range from sketches and different kind of models at various levels — “looks like,” “behaves like,” “works like” — to explore and communicate propositions about the design and its context” (Buchenau & Suri, 2000, p. 424).

Emerging methods that use machine learning are similarly accurate and useful but require an ongoing investment by news organizations and other actors in the public trust to ensure that they remain accurate and useful even as fraudulent media continue to become more and more sophisticated (Thomson et al., 2022, p. 957). *“Newsrooms are therefore embracing big data and artificial intelligence techniques such as knowledge graphs and machine learning for journalistic purposes such as identifying and contextualising newsworthy events in investigative journalism; facilitating data visualization in digital journalism; analysing information in data journalism; automating news writing in robot journalism; providing real-time fact-checking tools for political journalism”* (Ocaña & Opdahl, 2022, p. 1). The *DODO* assistant appears here as a way to complement this validation system, introducing the possibility of completely automating certain tasks that would be the responsibility of the journalist. In order to reach this point of technological advancement, it will be necessary to train and teach the assistant about certain essential information for the proper functioning of the system, this process can be achieved through annotations. *“In current newsroom workflows, metadata annotation like tagging and categorization is often performed manually by journalists. This is a time-consuming process that is error-prone, imprecise and restricts future usability. The added metadata is reduced to a few general categories that are limited to authorship, dates, content language and news management information”* (Ocaña & Opdahl, 2022, p. 4).

We consider that the *DODO* assistant will have the following functionalities so that it can autonomously help the investigative journalist:

Function specialists

Description:

This function makes the assistant find experts who are related to the investigation faster, giving suggestions for contact names and even links to social media pages that may be associated with these people.

Goal:

Find specialists and possible interviewers that can give more information about the project.

Function investigation in 3 words

Description:

This feature will make *DODO* suggest three words that define the investigation.

Goal:

Having a perspective of all work through three basic keywords.

Function mood tracker

Description:

This functionality will make the assistant communicate what is the journalist's mood at that moment and whether it is relevant for the journalist to continue carrying out activities on the platform, managing his mood.

Goal:

Give opportunity to the journalist have perception of his owns interventions on the work.

Function relevant data from the past

Description:

Here, the assistant will determine which data in the investigation are most pertinent to what the journalist needs to know.

Goal:

Highlight what are the most important data that happened in the past.

**Function "by which criterion do you want to organize your data?"
(creation file gives you, content gives you, presence of terms)**

Description:

This function, as it also exists on the *CTD* platform, will be done by the assistant, in an instantaneous way and will allow a suggestion of these relationships without the journalist asking for them,

Goal:

Make a suggestion over the time that the journalist is working with the platform.

Function finds evidence (for what?) find a specific word, find a statement, find by feeling/mode, find number, find similar image or video, find similar sound

Description:

In the same way as it happens on the platform, the assistant will be able to suggest relationships and similarities of data that the journalist needs to know at that moment.

Goal:

Giving a possibility to find, in a quicker way, specific data from a statement.

Function search for statement (in this group of data I want to find evidence for this statement "...")

Description:

Once again, this is a functionality that also exists in the *CTD* platform, but it will be done as a suggestion based on the assistant.

Goal:

There will be a field for the journalist to introduce the statement and the assistant will automatically suggest data relationships.

Function goes back to the field (redo)

Description:

This is one of the most important functionalities of the system, in which the assistant will suggest to the journalist to go back to doing field work and try to discover new data or new evidence.

Goal:

Determine new hypotheses for the investigation and in some way, a suggestion of the assistant to for the journalist to find new paths of investigation.

Chatbox

Description:

This functionality will allow for a conversation between the journalist and the assistant.

Goal:

Help the journalist with some particularity in the investigation.

Alert notification

Description:

DODO will alert journalists about certain matters that are pertinent and that make sense for the journalist to analyse at the time.

Goal:

Provide alerts and notifications, in the sense that they are related to the maximum degree of critical thinking and cognitive efficiency.

Magic wand

Description:

This functionality will allow the journalist to ask the assistant to magically perform some procedure or task, simply by asking or giving a command to perform that activity.

Goal:

Create a way of giving instructions to be automatically resolved by the system.

Critical interpretation of data

Description:

Here, the journalist will be able to ask *DODO* to make a critical interpretation of the data.

Goal:

Make the narrative of the investigation through text or the robotization of speech.

Missing data proposal

Description:

This functionality will distinguish which types of data may be missing from the investigation and which may be decisive for the progress of the same investigation

Goal:

Reaching specific conclusions that the journalist is looking for.

Level of pertinence of the subject studied

Description:

In this functionality, the assistant will determine, in percentage, the pertinence of the subject studied in relation to current affairs.

Goal:

To make a public interest assessment of the matter to be investigated.

Suggestion of approach with a higher level of relevance

Description:

If the assistant identifies a perspective on the subject or a more interesting angle of approach on the subject, it will be from this feature that the assistant will suggest new angles of approach or other perspectives that even the journalist has never thought of and that may be crucial to the success of the report.

Goal:

Identify different possible angles of investigation.

Cognitive efficiency scale

Description:

The assistant will mark out how the use of the *CTD* platform is being influenced or how it influences the parameters of cognitive efficiency.

Goal:

The assistant will take into account the following parameters to evaluate the cognitive efficiency of the system:

1. Difficulties/Frustration tolerance
2. Emotional state
3. Sleep (deprivation)
4. Food (nutrition)
5. Stress level
6. Level of attention/concentration
7. Personality traits
8. Memory
9. External stimuli
10. Reminder to take medication
- 11. Environmental factors**

Chapter 6. *Connect-the-Dots* prototype concept

6.8. Output

“To make data science more easily accessible for journalists in a more general sense, such tools need to utilize simple and easy to-understand visual interfaces that cater to the exploratory nature of the journalists’ activities, for example to allow the incorporation of unconfirmed data that can be used for further investigation ” (Stoiber et al., 2019, p. 706).

The output is the result of all the processes that were carried out on the platform, that is, an infographic with the results of the investigation - a visual expression of all the relationships created between the data, the statistical results in visual format of specific relationships between the data. That is, everything that the investigative journalist can use to create the journalistic piece, be it in text, video, audio. *“Structuring the information and integrating the data from a variety of sources bring newsrooms with better ways to exploit data and facilitate the adoption of AI. For example, it can ease the implementation of information retrieval services and recommender systems and the automation of news creation processes and the detection of fake news and newsworthy events” (Ocaña & Opdahl, 2022, p. 4).*

The output will be a summary of the investigative process on a single page, this output can be used as a basis for field reports, as an informative guide for the production of documentaries, television, audio, text or radio programs, not neglecting digital content and interactive reporting. It is important to mention that this output will be a digital publication of the conclusions drawn from the investigation and semiotic suggestions of the visual expression

of the data and the relationship of the data. Concludeential statistics allow the researcher to calculate the probability that a conjectured property of the data is due to chance, and to estimate the scale of the hypothesized effect (Gorman & Johnson, 2011, p. 1), so it will be important to include infographics based on relationships statistics for factual observation of data relationship. *“As the myriad examples presented earlier attest, journalists have a responsibility for the vision they embed into their news coverage and amplify on social media platforms, especially during crises and times when sharing a visual or amplifying an image could result in the potential for harm. Likewise, they also have a responsibility to increase their media literacy and technical acumen to ensure they can perform their verification and debunking mission with digital”* (Thomson et al., 2022, p. 957). In order for this responsibility and information accuracy to be achieved in our system, we propose the following parameters and results to include in the system output:

Board with lead

Description:

This board will show the research lead, that is, the paragraph that will integrate the essential information related to the research.

Goal:

Give precise information about a subject in less than three sentences.

Event continuation boxes

Description:

In the output, events and the continuation of events will be expressed through visual organization. For example, boxes containing textual information or even images and icons referring to the subject in question.

Goal:

Give visual expression to some specific relation between data.

Column with photo and an event

Description:

In the graphic expression of the output, columns with photographs referring to the event and a small explanation of the event or the subject in question can be used.

Goal:

Make a connection between a specific photo with a specific content.

Representative image of the investigation

Description:

Representative images of the investigation may be included, that is, iconographic systems that refer directly to the message that is intended to be conveyed.

Goal:

Select an iconography, a symbol or some sort of visual representation that communicates the essence of the project.

Board "in context" (main figure, when and where)

Description:

It will be possible to include in the output boards with a reference to the context of the investigation, where the main figure of the investigation is illustrated and when the certain subject occurred and how a certain subject occurred. This will all be on the same board.

Goal:

Give contextual information about certain data in the project.

Round diagrams

Description:

To express some relationship between the data, it may be possible to use round diagrams and also use the typography of percentages or numbers.

Goal:

Express some relationship statistical references relating to the data.

Big sentence

Description:

It will be possible to include in the final output a sentence that determines or reflects the most central content of the investigation, that is, a sentence that expresses the investigation.

Goal:

Create a unique sentence capable of expressing the essence of the investigation.

Photo exhibition

Description:

If the journalist wishes, he can also export an exposition of the data from his research in images.

Goal:

Give a minimalistic visual expression of the main photographs of the investigation.

Close up quote

Description:

It will be possible to include a reference to something that the interviewees have said or to something that the person under investigation has referenced in some document.

Goal:

Highlight a quote with a more prominent typography.

Round diagram with icons and leads

Description:

A diagram with icons and leads that were created on the previous platform can also be included in the final publication, that is, include all that information with more visual prominence.

Goal:

Give the possibility to express the relation between data through an iconographic diagram.

Board results

Description:

A board in the final publication will be specifically used to present the research results in an expressive and well-readable way.

Goal:

Give expression to the main results obtained through the usage of the platform.

Board summarization

Description:

In one of the boards of the publication, the summary of the entire research will also be referenced, in a paragraph.

Goal:

Give visual expression of the summary created in the platform.

Board timeline

Description:

The final output will have a reference to the timeline created by the system and can be expressed in a more simplistic way.

Goal:

Publication or a visual impression of the entire structure of the timeline that can be perceived as output.

Board results triangulation

Description:

This board will include the functionality results, data triangulation and thus be expressed through an infographic that represents this relationship.

Goal:

Give visual expression of the results found in the process of triangulation.

PDF button as article

Description:

If the journalist wants to see these boards per page, it will be possible to export this publication with more extension in terms of pagination. As a rule, only one page will be exported, with a

summary of the results of the data analysis. But if the journalist prefers, he can have detailed access to the details of the investigation on each of the pages.

Goal:

Have a significant output capable of being integrated in the publication of the research, or by being used as informational source for the preceding steps on the investigation.

Board results data connected to statement

Description:

Finally, there will be a board that references all the data that are directly connected with the initial expression or with the explanation that the journalist gave on the subject, in the initial stages of the investigation.

Goal:

Reveal the most relevant results connected to the main statement.

Chapter 6. *Connect-the-Dots* prototype concept

6.9. *Connect-the-Dots Explorer* (mobile version)

As we have previously stated “*rapid prototyping is prototyping activity which occurs early in the software development life cycle. Since we are only considering early prototyping, we use the terms “prototyping” and “rapid prototyping” interchangeably. There are two prototyping methods: throw-away and evolutionary. Often prototyping is an iterative process, involving a cyclic multi-stage design/modify/review procedure. This procedure terminates either when sufficient experience has been gained from developing the prototype (in the case of throw-away prototyping), or when the system is complete (in the case of evolutionary prototyping)*” (Gordon & Bieman, 1995, p. 11). Given this notion of rapid prototyping, we consider it interesting to sketch a prototype to integrate into mobile phones.

Throughout the research process on this project and prototype, and faced with the latest events in conflict zones, we believe it is important to idealize an extension of the *CTD* platform for the mobile version. We are not talking here about a design oriented towards the use of the platform via mobile phones, but rather the creation of tools that only exist on the mobile platform and that work as an extension of the tool to introduce data collected in field reports and that can later be treated in the desktop version. *CTD Explorer* will also allow access to specific functions that help journalists in field research, especially in sensitive and conflict zones, such as, for example, access to offline tools, maps of survival resources. Water and electricity stations and points. Crossing with a mapping of areas of risk and military occupation.

We are also talking here about the incorporation of drone functionalities. *“Drone journalism consists of the use of unmanned aerial vehicles (UVAs), often called drones, in news gathering. Drones allow journalists to obtain high-definition aerial images that provide users with a bird's eye view and a bigger picture of the places in the news, which in fact lead to novel forms of witnessing the stories. Drones take visual journalism into the sky, which thus brings not only new ways to provide news coverage, but also new perspectives and forms of seeing the covered stories—e.g. underline the news content, add meaning, provide surprise or uniqueness—”* (Pérez-Seijo & Vicente, 2022, p. 46). This allows us to witness the launch of aerial journalism with smart capabilities, where the digital world is now heading towards a new press. *“This is the era of aerial journalism that created a new revolution in the media industry, where there are no geographical limits, and no restrictions placed by governments on the freedom to report news, or access to information”* (Almalki et al., 2022, p. 2). Both drone and AI to empower smart journalism, and make it a more sustainable and eco-efficient process (Almalki et al., 2022, p. 22). In order to achieve the desired results regarding the system's suitability for mobile, we consider the following procedure regarding the use of mobile phones:

1. Analysis of the scenario photo, description, testimonies (expertise)
2. Perceiving the environment (geographical analysis) (land survey)
3. Go research the subject, see commonalities, google, library, archives, talk to experts
4. Contrast with the data I collected, from the puzzle
5. See what's different again (the missing piece)
6. Share the conclusion

Given this practice, we are then able to devise which functionalities will be more interesting to incorporate into the mobile and which adapt, fundamentally, to the procedure listed above.

Board location

Description:

This functionality will allow the journalist to understand his location and if there is any information that, from a global positioning point of view, can influence his investigation or influence the fieldwork.

Goal:

Inform about the specific location of the journalist in the field.

Board points of reference field research

Description:

This functionality will make it possible to highlight, within reference points in the field, where the journalist is in the territory.

Goal:

Visually understand, through the smartphone, where are the points referring to his investigation are and which are interesting for the journalist to analyze.

Board drone

Description:

This functionality is linked to the use of drones by investigative journalists to be able to access territories that could compromise the safety and life of the journalist or to capture images and videos without being identified.

Goal:

Use the benefits of using a drone to ensure the safety of journalists in dangerous zones.

Offline tools

Description:

This feature will allow the journalist to use the platform without access to the internet, that is, it will allow access to features that do not and do not require internet access.

Goal:

For that journalist will have to activate this functionality that will use other resources besides the internet. Typically, these options will be feasible by downloading a pack of features to access the platform offline.

Upload field data

Description:

Here the journalist will be able to upload all the files that he captures or that he collects in the field research, inserting them directly into the *CTD* platform.

Goal:

Have a fastest way to upload content that will be available on the desktop platform.

Safe zone

Description:

This feature will tell the journalist which are the places in the territory where he is located that are considered safe and, in this way, know which places to go.

Goal:

Promote the safety of the journalists over the investigation itself.

Path highlight

Description:

This functionality may be connected with the previous option and will, in some way, highlight the path that the journalist must take to reach these areas of interest or safe areas to carry out his investigation in the field.

Goal:

Being able to identify the safest path to go.

Chapter 6. *Connect-the-Dots* prototype concept

6.10. *CTD* input on standard workflow newsroom investigative procedure

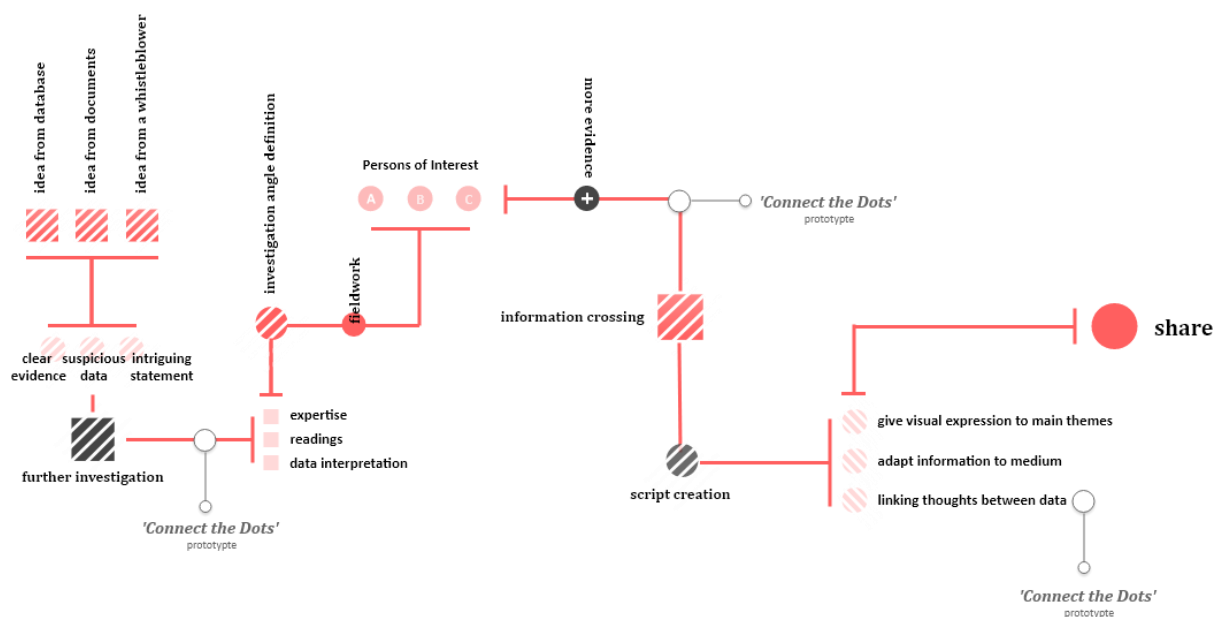


Figure 19 - Intervention points of the *Connect-the-Dots* prototype in the investigative journalism workflow.

“It is often useful to prototype critical aspects other than the user interface. Designing the entire system starting from the user interface can be dangerous, since the user interface may not characterize the best overall system structure. Thus, a user interface prototype should be considered a piece of a requirement specification and not a basis for system design. A prototype can also demonstrate functionality that is not possible under real-time constraints, and this problem may not be discovered until long after the prototype phase is complete. One way of avoiding this problem is to use an open system

development environment to make it easier to integrate faster routines when necessary” (Gordon & Bieman, 1995, p. 11).

The image above is our proposal for the investigative journalist's workflow. We explain through this infographic that the start of a research project can start in three ways: either by a complaint, by identifying a problem through document analysis or through the interpretation of information leak databases. Based on this beginning of investigation, the journalist can find irrefutable basic evidence for his investigation, he can find suspicious information or data that starts the investigation, or it can start with a spoken or written complaint. Taking these assumptions into account, the journalist begins to delve deeper through the investigation of the data explained above. To this end, the journalist will be able to inform himself through readings, interpretation of evidence (photos, sound clips), as well as interviewing experts in the area to be investigated. This is where the CTD can be useful. After analyzing all the information and data for a given investigation, the journalist chooses the approach angle for his piece, that is, the prism through which he will deal with the subject. After this decision, the journalist proceeds to field work, through interviews in the field and capture of information either through sound, image, or video. In this sense, it looks for people of interest for interviews, who may be victims or victims, or even testimonies. For the analysis of the data collected in the field, we also anticipated the intervention of the CTD. After analyzing the data collected in the field, the journalist proceeds to cross-check the exploratory information made at the beginning of the investigation with the data collected in the field, to find connections between the data, or evidence that go against the initial complaint. After finding a cohesive story resulting from this intersection of thoughts, the journalist proceeds to create the story to share with the public.

The basic structure of the prototype concept was designed to be integrated into the journalist's workflow, which is why we used as a reference the proposal for the investigative journalism process made in the thesis plan made in 2020. In the participatory observation we identified different investigative journalism procedures. The first, by analyzing Eduarda Maio's program Ponto de Partida, and the second by analyzing the intervention of journalist Luís Loureiro in the program Friday, at 9. *“These usually require an additional design phase to mass produce the final design. Some interactive system prototypes begin as one-of-a-kind models that are then distributed widely (because the cost of duplicating software is so low); however, most successful software prototypes evolve into the final product and then continue to evolve as new versions of the software are released”* (Beaudouin-Lafon & Mackay, 2000, p. 1007).

In structural terms, the workflow of investigative journalists is similar regarding research and investigation of a given topic. The most significant modifications refer to the adaptation of the investigation to the medium of expression. In addition to these two cases, radio Antena 1 and television RTP, we also consider it relevant to carry out digital ethnography to assess the workflow of investigative journalism at an international level, using as a reference the program “Trafficked” by Mariana Van Zeller and the program “Lost Cities”, by Albert Lin. *“Design principles help this process by guiding it both in the exploration and choice phases. The process continues, in a cyclic expansion and contraction of the design space, until a satisfying solution is reached”* (Beaudouin-Lafon & Mackay, 2000, p. 1010). In this way, we believe that it is possible to satisfy specific needs with a global understanding of the investigative journalism production system and the standardized procedures that we find in investigative journalism today.

Chapter 7. Conclusions

Chapter 7. Conclusions

7.1. Observed results

Given our project scope of the study of the design in information application production, during the last five years of research and investigation, we have made many developments and retreats in what concerns scientific confluences about artificial intelligence in investigative journalism, as well as in the research of tools with experienced journalists that would have a direct impact on performance and execution of investigative journalism. *“Not all journalists are positioned to serve as data intermediaries with the public. Legacy journalists, in most cases, lack the data literacy skills to successfully interface with ‘programming publics’ – the varied stakeholders (journalists, hackers, and citizens) who assemble around digital news production and consumption (Ananny, 2013: 637)”* (Boyles, 2020, p. 1340). Therefore, we believe that access to unfiltered information in the digital world is becoming more and more problematic challenged by large amounts of information. Knowing that *“prototypes increase creativity, allow early evaluation of design ideas, help designers think through and solve design problems, and support communication within multidisciplinary design teams”* (Beaudouin-Lafon & Mackay, 2000, p. 1029) the CTD platform emerges as a propose of an antidote to our globally misinformation.

When planning this project, we defined that the back-end would be part of a future integration by applying the prototype idea in real writing contexts. We will be able to accomplish this idea in a future phase, developing the code required for its implementation, so

the data collected in the hypothetical design of the system will be preponderant as an execution plan for this tool.

“As researchers, we want to learn about some aspect of learning by designing an intervention that, through subsequent iterations, gets better and better at activating and supporting that aspect of learning. As designers, we want to use research on the use of the designed intervention, as well as prior research knowledge, to improve the effectiveness of the design” (Joseph, 2004, p.236).

The idealization of the proposed solution took place through the application of questionnaires, interviews, and remote interaction with the system *mockup* to understand what kind of interaction the journalist/investigator has with the graphic solution presented. The relevance of buttons, icons and grids will be studied, trying to understand if journalists assimilate the icons with their previously defined function. This particular test will allow to understand which tools will be obsolete, which buttons and search fields correspond to your initial idea, how long users take to find solutions, control course scenarios and ideologically understand the interaction between journalists and the fully automated system *DODO*.

Chapter 7. Conclusions

7.2. Usability tests

“Automated journalism, also known as algorithmic journalism, computational journalism and robot journalism, refers to the application of computer programs—namely, algorithms—to news work, with the aim to organize, interpret and present news pieces from structured data sets (...) In simple terms, data scientists develop methodologies and techniques that allow computer programs to learn from data, hence the name, which have the potential to be applied to highly time and labour-intensive tasks for humans” (Pérez-Seijo & Vicente, 2022, p. 42).

The Wizard-of-Oz technique lets users interact with partially functional computer systems. Whenever they encounter something that has not been implemented (or there is a bug), a human developer who is watching the interaction overrides the prototype system and plays the role destined to eventually be played by the compute (Beaudouin-Lafon & Mackay, 2000, p. 1015). We consider it opportune, in further investigations, to test the interface of the prototype idea, Wizard-of-Oz technique, through global usability tests on the prototype with the investigative journalists interviewed in the participant observation in the CPN of RTP, as well as with investigative journalists at the international level. These usability tests will be able to give valid clues about all the work represented in the prototype concept and will be important

to assess the continuity of the project in practical terms, considering the results observed in the tests.

Usability testing might be applied, in future iterations, to investigative journalists during the second iteration. In the first iteration, the goal was to collect data on automation needs in newsrooms. The second iteration will be based on the journalists' global perception of the result presented to these needs. *“A flexible initial plan is refined iteratively until completion of corresponding design cycles. Based on Level II Data and constant comparative data analysis, Refinements deepen a researcher’s understanding of the study context”* (Wang and Hannafin, 2005, p.18). Both the results obtained in the first iteration and the results shown in the second iteration will allow us to refine the prototype concept in order to be more compatible with reality.

Chapter 7. Conclusions

7.3. Implications for theory

During the investigative process in this project, we tried to understand how artificial intelligence can influence investigative journalism in the same way that investigative journalism can influence the development of artificial intelligence. We understand, therefore, that the *CTD* platform concept emerges in this context as a way of using artificial intelligence in favour of human beings in the deliberate struggle in search of justice and democratic equity, it could be an incentive for the development of investigative journalism at a global level and thus being able to restore humanitarian values that fail in most of the problems we see today.

During the process of investigating and building the system, we realized along the way what were the main conclusions that we can draw from all the experiments carried out for the construction of the prototype idea and how these processes were preponderant in basing hypotheses and conclusions that could have a significant impact on the scientific community.

One of the main theoretical lessons that we learned from the first iteration was during the experience at the innovation centre of the RTP in which we focused on the idea of including design thinking assumptions in the research process itself in order to facilitate the understanding of complex subjects. *“Any researcher who studies real-world learning situations makes choices about what to study. In many approaches to research, specification of research questions comes through identification of gaps in research literature—this is an important tool in design-based research as well”* (Joseph, 2004, p.236). A pertinent matter that we deduce from our experience is that there is a determining factor for the quality of content

produced by journalists and especially by investigative journalists and it is related to the physical and mental health of these professionals, which is proportionally linked with the concept of global health and by that “*there is the possibility of transforming systems, organizations, and, notably, transforming researchers and participants*” (Hoadley & Campos, 2022, p.215). This crossing of concepts gave us the possibility of concluding a practical solution to reach a better cognitive efficiency, through measuring and marking the parameters of the journalist's work.

We also drew from this experience accurate knowledge about most of the interviews regarding their level of confidence in robots and artificial intelligence. We realized then that most journalists are not comfortable with the idea of AI being able to create informational content and assume that in the future jobs in the information area will be critically reduced.

“Design-based research has the potential to generate theories that both meet teachers’ needs and support educational reforms” (Wang and Hannafin, 2005, p.15).

When the result of this interaction is different than expected, we will have to point out what the difference consists of and point out the necessary change to solve that problem. As stated by Hoadley & Campos (2022, p.209) the real essence of the problem is found in the relation between the theorist and the practical worker—through the medium of the linking science, depending on the conclusions drawn from this experience it will be possible to recognize the most interesting tools of this system. We can also measure the journalist's degree of acceptance of the algorithm and see which tools are strictly necessary to carry out this project.

“In these regards, design-based research does not replace other methodologies, but rather provides an alternative approach that emphasizes direct, scalable, and concurrent improvements in research, theory, and practice” (Wang and Hannafin, 2005, p.6). We introduced design thinking methodology for our software design to encourage creativity and the use of intuition as a fundamental process of investigative reporting. It was in this center that we realized how important respect for physical and mental health is for a greater cognitive efficiency of the journalist in investigation processes and we identified that infographics and data journalism can be preponderant for a superior quality of content creation.

Chapter 7. Conclusions

7.4. Ethical issues raised

“AI doesn’t have to be evil to destroy humanity. If AI has a goal and humanity happens to be on the way, it will destroy humanity as a matter of course, without thinking about it. No hard feelings. It is just like if we were building a road and an ant hill happens to be on the way. We don’t hate ants, we are just building a road – and so goodbye ant hill”. (Musk, 2018)

As previously mentioned, the application of automation and artificial intelligence in investigative journalism may highlight relevant ethical issues in the appropriation of robotics in human thought. When we talk about the use of artificial intelligence to increase and intensify the journalist's intuitive abilities, we also talk about the possibility of artificial intelligence having a negative influence on the journalist's behavior. In this context, we can talk about the ability of artificial intelligence to overcome human performance through algorithmic behaviors without conscience.

These deliberate acts carried out by machines obeying commands within algorithmic processes can in fact jeopardize and compromise human life, raising serious ethical questions about the use of artificial intelligence, in our case with greater vehemence in the proposal of the *DODO* assistant, which may have a certain level of independence from human behavior. When we talk about monitoring aspects related to mental health and cognitive efficiency because there is a margin of error and mismatch *DODO* intervention in specific cases that need

further study. When it comes to using AI-driven tools, journalists placed more trust in their own skills for doing journalism, rather than on the technical understanding of algorithms. AI was, thus, considered a necessary tool but not a replacement of journalistic work (Lopez et al., 2022, p. 11).

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7.5. Integration of the prototype idea in real scenarios

It was not difficult for us to imagine the integration of *CTD* in a real context, especially when using prototypes in scenarios that require greater human intervention. *“Whereas journalism is a profession that can be performed independently of specific training, the professions of technologists usually rely on recognized credentials from areas such as computer sciences, software engineering, or data analytics”* (Sirén-Heikel et al., 2022, p. 5). In these times, the ideal would be to develop the platform so that it can be used by journalists and find a communication medium interested in understanding the extent to which investigative journalism reports are favored by the integration of *CTD* and *DODO* in the information production process, a way of realizing the real usefulness of the tool and making a comparison between a report with *CTD* and *DODO* intervention and a report without artificial intelligence intervention. Studying the main differences in content and time spent in carrying out the tasks, only then will it be possible to understand the extent to which *CTD* positively influences the production of investigative journalism, respecting the human characteristics of the journalist. We know that *“in the simplest terms, Artificial Intelligence (AI) refers to systems or machines that mimic human intelligence and can iteratively improve themselves based on the information they collect, to perform tasks. Although artificial intelligence provides images of high-level human-like robots taking over the world, the purpose of artificial intelligence is not to replace humans. The aim is to significantly develop and contribute to human capabilities”* (Çelik, 2022, p. 162). Thus, *“programming journalists strive for higher journalistic capital, while*

newsrooms adapt by both embracing computational efforts as possibilities for journalistic reinvention and keeping a distance by labelling the work as technical. Journalistic values and values of technology (or reasons for utilizing technology), can contradict each other. The gap that needs to be acknowledged in order to stay accountable in computational news production is above all an understanding of technology as a companion (and antagonist) of agency in news production” (Stavelin, 2013, p. 6).

We believe that creation of jobs related to the maintenance of these automation platforms will increase, in addition to the software helping investigative journalists in their usual production of information. The opportunity to create jobs that relate journalism to computing and the programming language is also to take in consideration.

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7.6. Global health and *CTD*

Since the explosion of the COVID-19 pandemic, we have realized that global health has suffered a decline related proportionally to the increase in cases of psychosis and depression linked to isolation and global demotivation about the future. With the pandemic, we had a clear idea of the positive role of digital platforms that allowed social intersection during the months of confinement. In a way, the digital allowed to eliminate some problems caused by the pandemic, but it highlighted so many other related to the inflated use of digital platforms and social networks, making human beings question their role in this world, beyond of its mere digital representation. We took this issue into consideration and believe that using *DODO* as a journalist's best friend could be a way to monitor digital exposure parameters - at critical levels that are harmful to human beings, making journalists realize what is bad for them.

“We are now living in what many describe as a post-truth world. Post-truth activities can be defined as the public burial of objective facts by an avalanche of media content intended to appeal to emotion and personal belief”. (Maiden et al., 2020, p. 1)

When we talk about the influence of the COVID-19 pandemic on digital platforms and the consequent automation of tasks related to investigative journalism, we are also talking about the relationship between global health and journalism and even the information

consumption related to the pandemic. We talk here about issues such as social isolation, abstraction in digital toxic refuges and the discrediting of man in global terms. This means that global health has, in fact, decreased in relation to previous years, and we consider that there is a possibility of more cases of mental illness that could have repercussions in terms of work execution - even journalists who have been affected negatively by the pandemic and who are responsible for creating content that can become harmful in the information system. *“Artificial Intelligence (AI) is developing rapidly and gets applied in a many different areas [1]. The changes that AI will bring to our everyday life are already noticeable. This can also be seen in the media industry, which is increasingly shaped by digitalization and AI technologies. The latter are used for, e.g., automated text generation, translation of texts, and information research. They can greatly facilitate the editorial work and offer possibilities to create new digital services [2]”* (Kolo et al., 2022, p. 3202). This means that the human being who is used to interacting with the digital world must take into account these changes in digital information production itself and even expressions of digital content that are based on economic systems and not exactly on health.

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7.7. Humanitarian crisis and CTD

“Artificial Intelligence has become an essential part of our lives. It has without a doubt made life much easier and practical whether on a global scale such as economic and political development or on a smaller scale such as our day to day lives. The last half decade marked the beginning of the development of robots that have the ability to perform human tasks. Originally, it was expected that the main disadvantage of AI technology would be related to the loss of work prospects since humans would be replaced by machines that are able to operate in a more efficient matter” (Saidi, 2022, p. 357). In addition to the development of the pandemic at a global level, our research was carried out at a critical time when we were faced with a humanitarian crisis of Russian invasion of Ukrainian territory. Although there are different conflict zones globally, this most recent crisis has highlighted a more pressing need in the execution and application of investigative. some solutions can help investigative journalism gain strength in humanitarian crises through artificial intelligence. *DODO* could be helpful through its expression as a robot, helping the field investigation journalist to newspaper, the *CTD Explorer* design mobile version with specific features would also perform as investigative journalists tool in conflict zones.

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7.8. Data analysis results that influenced prototype structure

The structure of the *CTD* prototype first emerged from the investigative journalist's usual workflow, focusing more prominently on the processes inherent to critical thinking and research in a specific process. With the events that followed, we realized that, after the critical analysis of data, that it is necessary to look for more data in the field through interviews or data that are emerging, so we designed the *CTD* Explorer extension to integrate data that can complete the investigation in a more complex way. We also realized through participant observation that visual research maps could be preponderant for reducing data analysis time. It was through the surveys applied in the RTP experience at the level of acceptance of artificial intelligence in certain tasks that we were able to understand what type of automation journalists feel most comfortable with. We translated this information into the design of some *CTD* tasks, in the case of interviews, we were able to assess which filters are more interesting to develop.

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7.9. Study limitations

The main limitations of this project are to empirically understand whether the tools we envision will in fact be useful in the daily lives of investigative journalists. We also find it difficult to integrate open-source tools from other companies, that are in fact the sources of all functionalities we propose. Likewise, we find it difficult to integrate different databases across NGOs and private entities, in order to broaden the search spectrum allowed by the platform. There may also be some resistance in the integration of open-source tools from competing companies and it will also be complex to develop the back-end, so that all the resources work smoothly.

A major limitation that we foresee in this doctoral project is its misuse by journalists, despite being credible, who act in bad faith or by private investigators and detectives who do not consider the journalist's code of ethics.

“The fact that Artificial Intelligence Journalists have started and will begin to enter the media sector in some countries will also bring about the fear of being unemployed among journalists. This is an inevitable fact” (Çelik, 2022, p. 168).

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7.10. Clues for further research

“Applying AI technologies in news organizations requires interaction between the logics of journalism and the logics of technologists” (Sirén-Heikel et al., 2022, p. 6).

In a hypothetical way, and after analyzing all the data and prototyping evaluation results, we can say that it will be possible, in the future, to extend the project and foresee its operation in a hardware expression. In the case of investigative journalists who want to be recognized for using the *DODO* assistant, we envision the production of a physical robot, that is, a physical expression of the *DODO* assistant in a mini robot that will float above the journalist's shoulder designed to help journalists protect themselves in conflict zones where the robot, in addition to reporting on specific data relating to investigative journalism, would also have the ability to protect the investigative journalists.

This watch (smartwatch) would also be responsible for checking data related to the journalist's health. These solutions are just suggestions so that artificial intelligence can effectively be an extension of the human being and, above all, that artificial intelligence can be a positive influence for investigative journalism and to produce journalism in a broad scale.

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7.11. From theory to practice: how can a journalism support platform, based on automated tools and artificial intelligence structure, leverage the efficiency and the outcome of investigative reporting projects?

As previously mentioned, there are numerous ways for the *CTD* platform to leverage investigative journalism. What seems most pressing to us is the reduction in the time spent by the journalist in the analysis and interpretation of data relating to the ongoing investigation. Another obvious way of supporting investigative journalists is the integration of state-of-the-art technological tools, on the same screen and workspace, which allows journalists to be more skillful in understanding the data and the relationship between them. Regarding the *DODO* assistant, it will allow monitoring the journalist's health, taking into account the parameters for greater cognitive efficiency, which could translate into richer, impartial and efficient content for the enactment of social justice. If we consider in a hypothetical way the integration of the platform in the journalist's procedure, by reducing the effective time of investigation, it could result in faster reports and a consequent greater investment of the media groups in investigative journalism.

We can now answer these questions:

Q1. How can a journalism support platform, based on automated tools and artificial intelligence structure, leverage the efficiency and the outcome of investigative reporting projects?

A1. The answer to this question involves understanding how the support platform for the journalist's workflow will help the journalist in critical thinking for news production. We can conclude at this moment that by reducing the time of some tasks, this will make the journalist have more time and energy for more creative tasks. In this way, we can also say that by reducing the time spent on these more strenuous tasks, the investigation process as a whole will be reduced, that is, it will take less time to produce a piece of investigative journalism. If the *CTD* platform is used, this can also result in greater investment by communication media in this type of journalism, since it is more effective with less resources and takes less time to reach conclusions.

Q2. How can data visualization and data journalism be applied as tools to help investigative journalists?

A2. Data visualizations, and data journalism in particular, can be used in investigative journalism, as mental maps to help in the cognitive process of investigations, but can also assist as a reference in the final output of the *CTD* system, in which infographics are used to present results from the cross-referencing of data and also from the filters applied by the investigative journalist.

Q3. How can an assistant help journalists increase cognitive efficiency?

A3. This question can only be effectively answered with usability tests, but we can expect, given our research data, that the assistant can indeed help to increase cognitive efficiency values by suggesting to journalists when to stop working by being hampered by overexposure to monitors. This is a significant reference value, because cognitive efficiency is directly influenced by sleep and the time spent during a project, which becomes less efficient the less the journalist sleeps.

Q4. How can artificial intelligence help in the thinking process required in investigative journalism?

A4. The investigative journalist's critical thinking is what determines the value and effectiveness of their work. And in this sense, artificial intelligence and automation can be predominant, regarding the introduction of support systems and techniques that will reduce the journalist's workload, as well as assistants that measure and manage to analyse parameters of cognitive efficiency of the journalist. And that's why the *CTD* system combined with the *DODO* assistant might increase this cognitive efficiency and help in the critical thinking process and, therefore, the investigation will unfold in a more fluid way. It will be possible to reach more pertinent and more efficient conclusions given the global analysis of the data entered in the system. Therefore, we can speak here of an level increase of excellence of the information product generated by research.

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Appendixes

Appendixes.

Appendix 1_ Surveys model analysis

Code	Medium	News platforms used	Information recycling	Journalistic workflow	Field work criteria	Softwares used	Trust level in AI	AI solutions to help journalists	Data journalism as future	Role IR today	Information access to all
Technician 1	Inovation Center	Tv on air; Agregadores de notícias online (Google News)					Inovador	Sistema de validação de fontes capaz de reconhecer manipulação de imagem, texto ou som	Inovador	Pouco significativa	Sim, "Conhecimento é poder"; Semelhança com as conferências TED: Ideias que merecem ser disseminadas
Technician 2	Inovation Center	Televisão; Youtube; Google					Muito inovador	Base dados nacional e internacional não tutelada por governos	Pouco inovador	Muito significativa	Não, é preciso averiguar a sua veracidade e a segurança da fonte.
Technician 3	Inovation Center	RTP,SIC,TSF; Noticias na rádio; Sites de notícias internacionais; Youtubes					Muito inovador	Plataforma que junte agências de notícias e outros recursos num só local.	Inovador	Significativa	Não, por causa da privacidade.
Technician 4	Inovation Center	Web; Jornais internacionais					Muito inovador	Novos modelos de base de dados e base de fontes credíveis	Inovador	Muito significativa	Sim, estar bem informado é meio caminho andado para formar opinião e ter melhor conhecimento sobre o futuro.
Technician 5	Inovation Center	Plataformas digitais					Muito inovador	Ferramentas que ajudam a confirmar dados	Inovador	Pouco significativa	Sim, desde que confirmada a veracidade e proveniência
Technician 6	Inovation Center	Digital					Inovador	Não respondeu	Pouco inovador	Pouco significativa	Sim, para termos uma sociedade justa e equilibrada.
Technician 7	Inovation Center	Web					Não tenho opinião	Sim	Pouco inovador	Pouco significativa	Sim, pela liberdade de escolha

Technician 8	Inovation Center	Internet; Jornais impressos; Televisão e rádio					Inovador	Software de organização de documentos/informação	Inovador	Muito significativa	Sim, todas as pessoas devem estar informadas. A tomada de decisões é mais fácil quando temos informação completa correta e perceptível.
Technician 9	Inovation Center	Rádio, Net, Televisão					Inovador	Não respondeu	Inovador	Pouco significativa	Sim, a informação é a base para uma sociedade livre e democrática. Se não estiver ao alcance de todos a verdade é distorcida com facilidade e os "desinformados" facilmente manipulados.
Technician 10	Inovation Center	Feed News no telemóvel; Público/Expresso					Inovador	Software banco de dados universal	Não tenho opinião	Muito significativa	Sim, desde que super validada e confirmada . Se bem que há casos em que o timing da informação poderá ser nocivo ou gerar interpretações erradas.
Technician 11	Inovation Center	Jornais; rádios					Inovador	Templates de organização mental e narrativa	Inovador	Muito significativa	Não, a informação de fontes não credíveis deve estar sujeita a escrutínio pelas entidades reguladoras, para evitar a distorção da realidade.
Technician 12	Inovation Center	TV; Web; Sites informação jornais online					Muito inovador	Compilar e filtrar informação e dados; Criação automática de grafismos claros e rigorosos para ilustrar a informação transmitida.	Pouco inovador	Muito significativa	Não, deve só ser acessível e com o devido rigor a informação que seja do interesse geral.
Technician 13	Inovation Center	Internet no computador e telemóvel					Muito inovador	Auxílio para cruzamento de dados	Inovador	Muito significativa	Sim, desde que sejam garantida a privacidade do cidadão.

Technician 14	Radio	Sites desporto; Agência notícias	Sim, as que são relevantes e que podem ser desenvolvidas	Recolher informação sobre o tema; escutar interlocutores, gravar sons que ajudem à sonorização da peça radiofónica	O que está acontecer, quem e onde e porquê	DaletPlus; Audicity	Muito útil	Ferramenta que nivele automaticamente o som do autor e o som que se inclui na notícia.			
Technician 15	Radio	Não respondeu	Sim, Lusa e jornais	Usar o som como ferramenta principal da história	Atualidade informativa	DaletPlus	Muito útil	Não respondeu			
Technician 16	Radio	Internet, agências informação, jornais	Sim, reciclar, atualizar e aprofundar.	Recolher informação; Cruzar dados; Falar para o ouvido; Colocar linguagem simplista	Recolher depoimento de pessoas credíveis; Observação; Verificação; Construção de texto; Conto a história	DaletPlus	Muito útil	-----			
Technician 17	Radio	Jornais, Rádios, Televisão on line	Sim, reciclar não é o termo certo; notícias de outros meios podem ser ponto de partida para desenvolver.	Seleccionar a informação; verificar fontes; escrever de forma clara e acessível a todos.	Ser os olhos de quem não está no local.	DaletPlus	Não tenho opinião	Não respondeu			
Technician 18	Radio	Televisão, rádio, jornais, internet	Sim, jornais digitais e imprensa escrita	Identificar a notícia; Seleccionar informação;	O que está acontecer no momento	DaletPlus	Muito útil	Não respondeu			
Technician 19	Radio	Agência notícias; jornais; Sítios Internet	Sim, relevância para a matéria a emitir	Reunir material com que se possa contar a estória.	Novidade, esclarecimento, precisão de elementos	DaletPlus; Audicity; Outra	Útil	Não respondeu			
Technician 20	Radio	As disponíveis	Sim	Falar com os intervenientes da notícia, saber o que se passa, o quê, onde, quando, como e porquê.	A notícia em si, a descrição do que acontece	DaletPlus; Audicity	Útil	Nada			
Technician 21	Radio	Internet, jornais, rádios, televisões	Sim, para complementar a notícia	Não respondeu	Fontes fidedignas; cruzar informação recolhida no terreno; ouvir relatos e avaliar a credibilidade; trocar informação, o olhar do reporter é essencial	DaletPlus; Audicity	Não respondeu	Não respondeu			

Technician 22	Radio	Net; rádios; jornais; tv com sites on line; agências noriciosas	Não	Escrever como se estivesse a contar oralmente a história bde uma pessoa em concreto.	Contar o que vê; usar informações e testemunhos credivéis.	DaletPlus; Auditycy	Não respondeu	Não respondeu			
Technician 23	Radio	Jornais, agências noticiosas; informação on line	Sim, tudo que possa ser interesse público	Recolha informação, validação através de fontes credivéis; construir uma narrativa oralizada e de fácil compreensão.	Sempre o interesse público da noticia	DaletPlus; Auditycy	Útil	Formas mais simples de executar as peças.			
Technician 24	Radio	Jornais; rádio; sitios da net de órgãos de informação	Sim, todos os citados	Recolha informação, gravar testemunhos; selecionar, escrever e gravar.	O que está a acontecer e que é relevante para a sociedade.	DaletPlus; Auditycy	Não respondeu	Não respondeu			
Technician 25	Radio	Rádio, jornais, agência de noticias, televisão	Sim, em particular para agências de informação e jornais.	Pesquisa informação; procurar protagonistas; pontos de vista diferentes; gravar entrevistas; selecionar sons, construir textos; gravar editar e montar peças.	Depende muito do tipo nde reportagem.	DaletPlus; Auditycy; Outra	Útil	Não sabe responder			
Technician 26	Radio	Não respondeu	Não respondeu	Não respondeu	Não respondeu	Não respondeu	Não respondeu	Não respondeu			
Technician 27	Radio	Não respondeu	Não respondeu	Não respondeu	Não respondeu	Não respondeu	Não respondeu	Não respondeu			
Technician 28	Radio	Rádio, tv, jornais	Não respondeu	Não fez qualquer peça nesta empresa.	Não fez qualquer reportagem na empresa.	DaletPlus	Útil	Não respondeu			
Technician 29	Radio	Não respondeu	Não respondeu	Não respondeu	Não respondeu	Não respondeu	Não respondeu	Não respondeu			
Technician 30	Radio	Não respondeu	Não respondeu	Não respondeu	Não respondeu	Não respondeu	Não respondeu	Não respondeu			
Technician 31	Radio	Não respondeu	Não respondeu	Não respondeu	Não respondeu	Não respondeu	Não respondeu	Não respondeu			

Technician 32	Televisão	Jornais, Televisão, Internet	Não respondeu	Pesquisar nos jornais e internet; Contactar as fontes	Papel de cada interveniente; Perceber para que assuntos nos podem ser úteis e credíveis.	Q Cut; ENPS; Interplay; Vídeos e material das agências internacional .	Não tenho opinião	Já existem várias.	Sim, mas de forma criteriosa e esclarecedora.		
Technician 33	Televisão	Informação tv, jornais físicos e digitais	Sim, agência lusa, mas faço sempre a confirmação junto dos visados.	Procuro dinamismo, dar uma experiência de imersão com quem vê, usar linguagem simples e clara.	Relevância informática, proximidade com o público	Q Cut; ENPS; Interplay	Muito Útil	Ferramenta que ajude à experiência de imersão	Sim, vai ajudar a tornar um maior dinamismo.		
Technician 34	Televisão	Não respondeu	Não respondeu	Perceber a história, procurar informação, fontes credíveis; resumir o mais importante em linguagem clara	Fontes credíveis	Q Cut; ENPS; Interplay	Útil	Não respondeu	Sim, nem sempre há tempo para que se explore da melhor forma mas é o caminho.		
Technician 35	Televisão	Imprensa, Rádio, TV	Não respondeu	Pouco texto, apostado na imagem e som, bons planos e testemunhos	Procurar o melhor ângulo de abordagem da história	Q Cut; ENPS	Útil	Não respondeu	Sim, pode ser uma forma de fazer jornalismo, mas não vai ser a única.		
Technician 36	Televisão	Tv, Rádio, Jornais, Telex agência, imprensa escrita	Não	Análise cuidada das imagens e depoimentos; correção de textos	Recolher elementos factuais, exercício do contraditório, contextualização	Q Cut; ENPS; Interplay	Muito Útil	Não respondeu	Não, considero que é uma forma válida, interessante e apelativa mas complementar a todas as outras.		
Technician 37	Televisão	Internet, Jornais, tv, rádios	Sim, os mais variados quando é preciso matéria para entrevistas e dossier	O mais importante, o mais recente.	O mais importante dito e captado em imagens.	Q Cut; ENPS	Útil	Arquivo digital por temas	Não, mas entendo que é uma ferramenta essencial.		
Technician 38	Televisão	Internet; Jornais	Sim, outros meios	Recolha elementos, síntese	Recolha de elementos, Imagens, Declarações	Q Cut; ENPS; Interplay	Útil	Não respondeu	Não		
Technician 39	Televisão	Jornais, Televisão, Internet	Sim, Sites youtube, jornais	Recolha e análise dados, escrita, edição, correção erros	Critério jornalístico	Q Cut; ENPS; Interplay; Word; Excel	Útil	Não respondeu	Não		
Technician 40	Televisão	Sites notícias; jornais	Não	Pesquisar, escrever, escolher som e imagem	Atualidade; Acutelância	Q Cut; ENPS; Interplay	Útil	Não respondeu	Não		

Technician 41	Televisão	Jornais, Rádios	Sim	Contactar as partes; recolher imagem; Fazer reportagem	Credibilidade dos protagonistas e veracidade documental.	Q Cut; ENPS; Interplay	Útil	Sites que agregassem o máximo informação sobre uma empresa ou um titular de cargo público.	Não		
Technician 42	Televisão	Jornais, Internet, Fontes próprias, Leituras, Agências noticiosas	Sim, jornais on line	Consultar informação nas agências, nas fontes primárias de informação, visualizar as imagens e as entrevistas.	Atualidade, novidade, impacto, interesse público	Q Cut; ENPS; Interplay; Agências noticiosas	Útil	Não respondeu	Não		
Technician 43	Televisão	Jornais. Rádio, TV	Sim, jornais online, tv	Ouvir entrevistados, pesquisar informação, consultar arquivo	Proximidade, atualidade, impacto no público	Q Cut; ENPS; Interplay; Internet	Não tenho opinião	Não respondeu	Sim, se acompanhado de informação mais completa e explicativo.		
Technician 44	Televisão	Sites, ciência, medicina, UE, OMS, Google	Sim, estudos científicos publicados, noticias imprensa ou rádio	Reunir informação e cruza la por diferentes fontes; Procurar testemunhos diretos e do indvual passar par o geral; Credibilizar com perspetivas de especialistas e contraditório;	Critérios jornalísticos	Q Cut; ENPS	Não tenho opinião	Uma que permita maior transferência de dados e imagens com maior rapidez para a fonte de emissão e que também permitisse acesso do jornalista independentemente do local.	Não		
Technician 45	Televisão	Jornais on line, agências noticiosas, jornais e redes sociais	Sim, se for informação relevante que ajude a complementar o tema que estou a tratar.	Analisar o tema; ouvir as partes, contar as histórias de acordo com a relevância para o receptor	Mais relevante; o que afeta mais pessoas; Mais recente	Q Cut; ENPS; Interplay	Útil	Uma que possibilite agregar as várias e diversas ferramentas que utilizamos diariamente	Sim, mas não a única acredito que terá o seu espaço.		
Technician 46	Televisão	Jornais; Rádios	Sim, noticias avanzados por outros orgãos ou formatos	Captar imagens; Ter o contraditório	Factos relevantes que trabalhamos para ter informação fidedigna	Q Cut; ENPS; Interplay	Muito Útil	Arquivo de informação	Sim, é um dos caminhos do jornalismo.		
Technician 47	Televisão	Jornais, Internet	Não	Tem de haver noticia; Quem, o quê, onde, como, quando e porquê	Ouvir todas as partes	Q Cut; ENPS; Interplay; Youtube	Útil	Plataformas multidisciplinares mediante o pagamento de uma avença mensal	Não		

Technician 48	Televisão	Aplicações de orgãos comunicação social; jornais; internet	Não	Informar o mais possível em várias plataformas; escrever com simplicidade para que a peça seja entendida por todos e seleccionar as melhores partes das entrevistas.	A notícia através das histórias das pessoas que a vivem/viveram.	Q Cut; ENPS; Interplay	Útil	Algo que reunisse a informação resumida de um determinado assunto.	Sim, é cada vez mais importante saber separar o trigo do joio.		
Technician 49	Televisão	Internet, Rádio, Tv, Jornais	Não	Seleccionar tema e informação; Trabalho no terreno; Fontes; Construção texto, imagem, edição e emissão.	Observação própria; Informação variada; Fontes diversas.	Q Cut; ENPS; Interplay	Muito Útil	Não sei	Não		
Technician 50	Televisão	Apps de notícias; Televisão; Rádio; Jornais Papel	Sim, jornais on line ou papel	Ouvir fontes fidedignas; Comparar diferentes informações; Ouvir diferentes partes.	Aceder a informação oficial; Ouvir diferentes partes; Seleccionar aquela que considero com maior valor.	Q Cut; ENPS	Muito Útil	Verificador de informação que cruzasse tudo o que foi escrito com fontes oficiais.	Não		
Technician 51	Televisão	Jornais; Revistas; Rádio; Rede sociais	Não respondo	Procurar todas as fontes, cruza las, recolher imagens, entrevistas e estruturar reportagem.	Isenção; Objetividade; Rigor.	Q Cut; ENPS	Pouco Útil	Poligrafo online sobre entrevistas e declarações dos protagonistas.	Sim, não sei se será o futuro do jornalismo mas ajudará sempre no trabalho do jornalismo.		
Technician 52	Televisão	Rádio; TV	Sim, sempre que inspira confiança	Recolha de dados; Cruzamento informação; Escuta de protagonista.	O que é mais relevante;	Q Cut; ENPS; Interplay	Muito útil	-----	Não		
Technician 53	Televisão	Rádio; Imprensa; Informação online	Sim	Elencar factos; Contactar fontes; Cruzar informação; Captar imagens; Agilizar meios para que tudo esteja reunido em tempo útil.	Critério jornalístico; Elencar factos; Contactar fontes; Cruzar informação.	Q Cut; ENPS; Interplay; Youtube	Útil	Plataforma tipo Poligrafo para separar a verdade dos fake news	Não		

Technician 54	Televisão	Computador; Telemóvel	Sim, às vezes acontece.	Analisar a matéria; Fazer entrevistas; Estudar o assunto; Procurar assunto na internet.	Ver o que é notícia; Confirmar factos	Q Cut; ENPS; Interplay	Útil	Não pensei muito nisso.	Sim, pode ser que sim		
Technician 55	Televisão	Jornais; Sites oficiais; Agências internacionais; Youtube; Redes sociais.	Sim, muita informação partilhada online.	Leitura artigos e notícias; Encontrar as melhores imagens; Acompanhar a evolução dos acontecimentos;	Analisar o que está acontecer; Falar com o máximo de pessoas possível; Escolher os intervenientes mais pertinentes; Procurar melhor imagem para contar a história.	Q Cut; ENPS; Interplay	Muito útil	Aplicações para identificar fake news; Plataformas que possam ajudar a localizar datas de algumas notícias que vão circulando na internet.	Sim, a produção digital de notícias é uma mais valia ao nosso trabalho e atrai, cada vez mais, as gerações mais novas.		
Technician 56	Televisão	Sapo; RTP play; RTP notícias; Google notícias.	Não	Pesquisa exploratória; Escrita narrativa e complemento com imagem.	Aquilo que está acontecer mas com perspectiva diferente.	Q Cut; ENPS; Interplay, Premiere	Muito útil	Sinónimas, imagens guardadas para computador.	Sim		
Technician 57	Televisão	Alertas digitais; Redes sociais	Sim, jornais online, tv	O que é notícia	Atualidade e valor notícia	Q Cut; ENPS	Útil	5G	Sim, encriptar a informação mais importante é o segredo .		
Technician 58	Televisão	TV; Rádio; Imprensa; Sites dos Medias; Mail; Redes Sociais.	Sim, imprensa.	Construo alinhamentos não peças.	Não efetuo reportagens	Q Cut; ENPS; Interplay	Não tenho opinião	Plataforma que permitisse ver uma mesma notícia em vários sites	Sim, será apenas uma parte.		
Technician 59	Televisão	Sites; Tv; Jornais; Rádio; Nacionais e internacionais	Sim, depende da informação mas por regra a RTP está à frente.	Investigar; Ouvir todas as partes; Interpretar e contextualizar.	Procurar ouvir e esclarecer.	Q Cut; ENPS; Interplay	Não tenho opinião	Não respondeu	Não, tenho muita dúvida.		
Technician 60	Televisão	Jornais; Meios comunicação internacionais e online; Livros históricos; Séries televisivas; Documentários.	Sim, uso de informação de contexto; Ponto de partida para outras; Reportagens; Outros ângulos de investigação.	Leitura sobre o assunto na imprensa e estudo de caso; contacto com fontes; Cruzamento dados; Recolha de testemunhos.	Olhar para informação mais relevante para o telespectador; Avaliar a informação a partir do cruzamento de testemunhos e relatos.	Q Cut; ENPS; Interplay	Muito útil	Base dados com informação relevante no tempo, com dados certificados e atestados de veracidade;	Sim, -----		
Technician 61	Televisão	Twitter, Sites noticioso; TV	Sim, Youtube, imprensa especializada; sites dos clubes	Imagens da notícia; Declarações dos intervenientes	Dar prioridade ao que é novidade e mais importante	Q Cut; ENPS; Interplay	Útil	Plataforma de gráficos amiga utilizador	Não respondeu		

Appendixes.

Appendix 2_ Investigative journalists interviews analysis model

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Nome	Meio do Comunicação	Jornalismo de Investigação na Atualidade	Procedimento habitual de Jornalismo de Investigação	Softwares e ferramentas utilizadas no Jornalismo de Investigação	Opinião sobre AI e programação no Jornalismo
Jornalista 1	Rádio	A Jornalista fala particularmente da sua experiência como jornalista de investigação no programa "Ponto de Partida" emitido semanalmente na Antena 1. A jornalista explica que é um programa sobre ciência que "faze divulgação da investigação com base em Portugal e do trabalho dos investigadores portugueses". "Eu sinto maior riqueza em utilizar só o áudio".	A jornalista explica as diferenças estruturais encontradas entre jornalismo de atualidade e jornalismo de investigação, explicando que o primeiro diferencia-se pela sua extensão de conteúdo e de investigação, sendo o jornalismo de investigação mais aprofundado que o jornalismo de atualidade. "O jornalismo de atualidade fica-se pela rama".	A jornalista explica que utiliza bastante a internet para fazer pesquisas basilares, sobretudo softwares online. Utiliza programas básicos e gratuitos como o Facebook para lançar os temas dos programas. Utiliza alguns programas para edição sonora. O foco da jornalista recai sobre plataformas de informação, nomeadamente plataformas de Universidades para saber o que está a ser criado na ciência.	

Jornalista 2	Televisão	<p>O jornalista acredita que o jornalismo de investigação não é uma área à parte da atualidade. "O jornalismo de investigação, o que faz muitas vezes é influenciar claramente a atualidade". O jornalista fala especificamente da sua participação no programa Sexta às 9 e como o jornalismo de investigação tem impacto na esfera pública. O jornalismo de investigação pode-se enquadrar na categoria de grande reportagem.</p>	<p>O jornalista explica que a base fundamental do jornalismo de investigação na RTP é a busca pela verdade. O jornalista explica que chegam muitas informações ao programa Sexta às 9, por que é um programa que vive fundamentalmente de denúncias. O que realça um carácter mais negativo da situação. Só é possível trazer essa informação a público "sem fazermos um processo de verificação muito rigoroso, porque depois também estamos nós a arriscar a pele e estamos a arriscar a nossa credibilidade". O jornalista fala ainda da necessidade de falar com muitas pessoas sobretudo com muitos especialistas, e da necessidade do jornalista avaliar a veracidade da denúncia através da comunicação gestual e olhar entre jornalista e denunciante. O jornalista também explica que existe um grande enfoque na verificação de documentos que lhe chegam às mãos e que muitas vezes o cruzamento de dados desses documentos é suficiente para aferir a veracidade do documento e do conteúdo do mesmo. O jornalista refere ainda que normalmente na investigação científica as fontes de informação são neutras, no entanto, no jornalismo de investigação as fontes de informação são interessadas - o que altera significativamente as metodologias.</p>	<p>O jornalista refere SPSS e o Excel como duas referências para analisar grandes quantidades de informação. O jornalista explica que o NPS é uma ferramenta que utiliza para edição. No entanto Luís confessa que muito do seu trabalho é manual e utiliza muitas vezes uma caneta e uma calculadora. Também destaca que utiliza muitas vezes o Google Translate. O jornalista também fala das limitações do Excel no que diz respeito à comparação automática entre colunas - grande parte da informação valiosa está nos devios à norma.</p>	<p>O jornalista afirma que a automação e inteligência artificial podem ser preponderantes em "cenários em que haja grandes quantidades de informação digital para procurar". Fala também da necessidade de automação de processos de estratégicos de pesquisa de estudo de caso. O jornalista destaca a necessidade da criação de algoritmos que ajudem a categorizar a informação. "Se conseguir utilizar uma ferramenta informática que me trabalhe matematicamente e de acordo com processos estatísticos, essa informação já tenho aqui uma boa ajuda". "As timelines para mim são ferramentas fundamentais para para o jornalismo de investigação". "Se esse software pudesse distinguir esses elementos textuais e relacioná-los com datas, ele podia estabelecer logo uma timeline daquele documento, por exemplo".</p>
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Jornalista 3	Televisão	A jornalista reconhece que o papel do jornalismo de investigação sempre foi importante. "Há agora armadilhas têm a ver com falsas notícias, com falsos testemunhos." A jornalista percebe que hoje em dia o jornalista de investigação tem de ter mais cautela que no passado. "A investigação é precisamente parar o relógio. E obrigar as pessoas a ver as coisas de outra forma e chamar a atenção das pessoas a".	A jornalista fala que o seu trabalho como jornalista de investigação começa com uma denúncia. A partir dessa denúncia a jornalista tenta perceber quem é a pessoa lesada na situação e normalmente essa pessoa é a última a ser contactada. Deve-se sempre também apanhar a pessoa que queremos investigar de forma mais espontânea possível, para ela não estar preparada. Quando se trata de empresas, Helena sugere as rádios e o portal da justiça.	A jornalista afirma que utiliza muito o Facebook quando se trata consultar processos, existe a necessidade de pedir um requerimento à procuradora. A jornalista procura também informações judiciais através dos portais digitais governamentais e quando não consegue aceder por estes meios vai fisicamente ao tribunal. Helena refere que utiliza o computador para aceder a plataformas normais, jornais online, coisas antigas - uso também do arquivo para aceder a notícias do passado.	"Acho que às vezes fazemos. Muitas vezes fazemos jornalismo para nós próprios, para os pares. E não fazemos para as pessoas, fazemos para os pares". A jornalista fala que o jornalista sempre se adaptou às novas tecnologias e como aconteceu no passado, no futuro teremos o mesmo nível de adaptação.
Jornalista 4	Televisão	O jornalista afirma que o jornalismo de investigação se baseia sobretudo no interesse público. Explica também que o jornalismo de investigação vai além do jornalismo de atualidade.	O jornalista fala sobre a utilização de câmaras ocultas na investigação no terreno e da capacidade do jornalista dar a entender que não existe nada a esconder. Afirma também que o jornalista tem de estar preparado para aquilo que vai encontrar, portanto existe um nível elevando de gestão emocional. Também é importante fazermos essa ressalva quando o só transmitimos as imagens quando sabemos que, de facto, aquilo é um ilícito que a pessoa está a fazer, porque aí estamos protegidos pelo nosso código deontológico". O jornalista fala na necessidade de saber tudo e ouvir todas as partes, confrontar e dar oportunidades iguais. O jornalista fala também da "chuva" de emails de denunciantes para o Sexta às 9.	O jornalista afirma utilizar o ENPS e o QCut, e que para além destas ferramentas associadas à RTP, utiliza também o Google Drive.	O jornalista afirma que seria interessante haver mais aposta das redações na inclusão de conteúdos em plataformas como Youtube e Instagram TV, porque considera que será uma alavanca para o jornalismo de investigação se tivesse expressão nessas plataformas. O jornalista acredita também que os noticiários do futuro serão estruturados pelas preferências do consumidor, estando a grelha alinhada ao que o telespectador quer ver primeiro.

Jornalista 5	Renascença	<p>O jornalista fala da sua colaboração com a rádio Renascença por ser um dos poucos jornalistas de dados a operar em Portugal.</p> <p>Normalmente o seu trabalho está associado em grandes grupos de dados que necessitam de expressão visual. No que diz respeito ao jornalismo de investigação, o jornalismo de dados pode ser considerado como uma técnica ou especialidade que pode ser integrada no jornalismo de investigação.</p>	<p>Habitualmente o trabalho do Jornalista passa por encontrar um ângulo alternativo e mais interessante para uma história. "Por exemplo, fizemos uma análise de sentimento com os programas eleitorais nas europeias, ou seja, o pegamos em todos os programas de todos os partidos e fizemos usamos lá está métodos estatísticos para fazer reconhecimento de sentimentos".</p>	<p>"A parte da análise de dados é feita em RE". O jornalista refere que utiliza programa o front-end para publicar no site, e que faz as visualizações de dados em D3 - Javascript D3.</p>	<p>"Os jornalistas dados em Portugal não conseguem jogar à sueca". O jornalista afirma que existem muito poucos jornalistas de dados em Portugal e que afirmar que deveriam de haver mais, mas que a própria natureza da especialidade não atrai muitos jornalistas, devido à necessidade de conhecimento de linguagens de programação muito complexas.</p>
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Appendixes.

Appendix 3_ Current affairs journalists interviews analysis model

Meio de Comunicação	Cargo na redação	Hábitos de consumo informativo no digital	Opinião sobre automação e inteligência artificial	Softwares e ferramentas utilizadas	Potenciais ferramentas e plataformas que poderão ser criadas
Rádio	Diretor de informação	Utilização do universo digital, das redes sociais. "Rádio é dos meios de comunicação social tradicionais, aquilo que se mantém."	Deve-se manter, na transição para o digital a magia da rádio, a magia do som.	Youtube, Facebook e Instagram para transmissão e difusão em direto da visual radio	O entrevistado concorda que todas as ferramentas sugeridas para a plataforma devam ser criadas para ajudar o jornalista
Rádio	Jornalista	A jornalista refere que existem algumas lacunas na utilização de softwares na redação do Porto, como o acesso às pastas.	A jornalista refere que poderia haver um maior desenvolvimento das plataformas digitais em relação à produção de rádio.	A jornalista utiliza o DaletPlus, destacando o seu papel no arquivo e partilha de sons. No entanto Cláudia admite que existem algumas deficiências no sistema.	Criação de um software com maior alcance possível de rede interna de forma a facilitar o trabalho.
Televisão	Jornalista	"Há também o digital online de todo a vários jornais de revistas portuguesas e internacionais, jornais internacionais."	"Poderão é ter ferramentas já disponibilizadas na óptica do utilizador, ou seja, jornalista ser o utilizador consumidor dessas mesmas ferramentas que é provavelmente com." ; " Bom, eu acho que estamos a fazer esse trajeto és do investimento no digital RTP play."	"Hoje eu socorro muito, obviamente, da Internet na pesquisa imediata, até porque a maior parte das vezes acontecem coisas."	" Acho que uma plataforma que conseguisse ser uma espécie de Google jornalística , ou seja, que fizesse uma espécie de enciclopédia." ; " Eu acho que a timeline era fundamental. A timeline é fundamental porque nós temos imagina, processos judiciais nunca mais acabam e agora são complexos enormes processos de milhares e milhares de páginas."
Televisão	Diretor de informação	" Há algo que contribui para a nossa memorização intelectual e para o nosso afunilamento. Aquilo que devia ser o contrário, devia ser uma abertura ao mundo e muitas vezes um afunilamento ao mundo."	"Porque o mundo digital muitas vezes está de braço dado com essa ignorância, o Facebook afunila os nossos interesses. Só há um algoritmo que me dá o aquele tipo de coisas que eu procuro." ; " Portanto, aquela ilusão do mundo digital. É o chamado gueto digital."	" Estamos a falar o NPS é um sistema desenvolvido pela AP. A Associated Press não é que é umas das principais agências."	" Acho que é uma inevitabilidade do futuro."

Televisão	Jornalista		" Atualmente consome. Hoje em dia a televisão vai ter que mudar e vai ter que se adaptar. Vai ser uma coisa mais do é Nero Netflix, mas para notícias."		
Televisão	Jornalista			" Controle dos programas que são feitos e tê los, digamos, em situação em que estejam acessíveis e colocá los numa playlist, numa grelha de emissão que pudesse um conjunto de regras internas da RTP. Usamos para isso um software próprio. É o software que, aliás, é. É hoje comum a toda a estrutura da RTP."; "Nós aqui nós temos softwares relativamente rápidos."	" Realmente tem a ver com fluxo de é dos que estamos a enviar e portanto, é muito mais por aí que suponho um problema diário de atraso do envio sheetal, porque a rede não cumpre, ou melhor, não consegue escoar todo o fluxo que é enviado. "
Televisão	Jornalista	" A agência agora, no caso específico dos limites nacional, agência de informação são essenciais órgãos de comunicação social portugueses e estrangeiros. A Internet muito também. As redes sociais hoje em dia são fundamentais jornais. E fontes de informação primárias. Pessoas que conheço. Pensadores, porém, livros que leio também."	" Eventualmente, vai ser uma coisa. Talvez menos falada. Talvez mais gráfica. Mais curta, todas as informações mais curtas, mais gráficas, mais diretas. Mas eu acho que o online vai migrar para a televisão, talvez aquilo que se faz hoje em dia online. Vídeo de 30 segundos que explicam rapidamente aquilo que está acontecer com mesa de palavras. E declarações minúsculas e que pões secalhar." ; " E que precisa de intervenção humana, não há uma máquina que seja capaz de pegar uma peça jornalística, televisiva e de repente dá lhe. Dar lhe uma finalidade para online sem passar por uma para ajudar, claro.. Lá está a integração de grafismo. Sim era útil."	" Nós usamos aqui o NPS que tu conheces. Para além disso, usamos o programa de edição que CUT. É fundamental também hoje em dia a internet, um browser. Vai ajudar a recolher toda a informação. Os twitter. Uso o Facebook hoje em dia é é essencial."	" Podia ter acesso, olha, por exemplo, era útil conseguir descarregar em vídeos do YouTube, por exemplo, diretamente e não conseguimos. Ou até fotografias do Twitter ou fotografias que possamos encontrar, temos que fazer download."

Televisão	Tradutor linguagem gestual		" Em Portugal portuguesa está sempre em evolução, estamos, nós interpretamos sempre informações constantes no âmbito da justiça com os professores surdos, com a comunidade surda."; " É muita gente mas é uma ninguém nós pode substituir. Por muito que se possa daqui a 50 anos existir um robô que já pensa nisso." ; " Ainda vai demorar muito, muito é nos substituirem."		
Televisão	Jornalista	" Mas o interplay que é automaticamente posto no servidor. Tudo em formato digital."		" No servidor no interplay irmos buscar e ser mais rápidos mandar porque a maior parte das vezes do antigo tempo tem que ser por cassetes."	
Televisão	Jornalista			" Acho que o noticiário do futuro não terá nada a ver com isto. Nós podemos agora aqueles blocos noticiários diários, pronto que podiam ser muito mais reduzidos."	
Televisão	Assistente			" Estamos a mudar agora do software, ainda por cima sim do NPS."; "Estamos a mudar, só tínhamos o NPS é agora temos uma nova versão que ainda estamos um bocado, todos a experimentar, porque ainda não tivemos formação sequer."; " O layout é mais user friendly, se calhar."	

Televisão	Produtora			<p>" Nós usamos sem qualquer tipo de dúvida esse equipamentos 4G. E efetivamente as coisas facilitaram muito dessa perspectiva no sentido de conseguirmos rapidamente estar num local e fazer uma intervenção em direto."; "</p> <p>É assim, nós temos o alinhamento todo no NPS. É a ferramenta que nós usamos atualmente. Onde temos tudo, temos os alinhamentos, temos a agenda do dia a dia, agenda do dia seguinte, onde temos lá os serviços, todos temos é uma ferramenta essencial para a produção, que é o mapa dessa que é uma, que é um documento onde nós temos sintetizados todos os diretos do dia. Porque se tivéssemos que percorrer agenda toda."</p>	<p>" Seria ótimo se inventassem uma coisa do género no alinhamento e conseguir pôr lá todos os dados que preciso. Os contactos telefónicos, por exemplo, que eu introduza isso como se fosse uma página Word não é, tenho lá uma linha para os diretos e eu meto lá toda a informação é era ótimo."</p>
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Televisão	Jornalista	<p>" Bem isto, a política internacional é uma coisa muito, muito vasta e é uma coisa que eu gosto muito e que não me é difícil fazer trabalho de casa. Ou seja, eu gosto muito de seguir a imprensa estrangeira. Tenho as minhas aplicações sempre ativas no telemóvel, portanto estou sempre atenta. Quando chego à redação o que é que tenho. Que utilizar a nós temos o. Pagamos a RTP tem um serviço das agências da Lusa, da Reuters e da França Presse."; " Posso desejar o que é que me chega. Mas não, não posso controlar o que me chega e portanto, eu tenho que me cingir aquilo que as agências internacionais enviam, àquilo que eles selecionam, às bocas que selecionam. "; " Eu também procuro ver nos jornais físicos nacionais e depois dessa pesquisa nas agências internacionais e nos jornais internacionais através da internet."</p>	<p>" Eu tenho alguma dificuldade em prever isso, porque isto tem realmente mudado tanto e tão depressa nos últimos anos. A que nós às vezes não achamos isso. É, mas às vezes temos que fazer trabalhos de pesquisa de acontecimentos."; " Acho que tem vantagens e desvantagens. Todo este avanço tecnológico. O que eu percebo também do que vou vendo lá fora, cada vez mais se pode tornar um trabalho mais individual." ; " Daí eu percebo que as pessoas tenham tentação de publicar tudo o que vêem tudo o que sabem. E às vezes querer substituir aos jornalistas, mas eu acho que a credibilidade vem precisamente de uma marca forte de haver marcas fortes em termos de comunicação que as pessoas possam distinguir claramente o que é uma plataforma de 1/01/1, órgão de comunicação tradicional."</p>	<p>" É depois é o processo de, a partir do momento em que tenho selecionado a informação, escrevo no NPSA. E depois desde para editar, juntando as bocas que já estão agendadas com o meu texto, com as imagens que seleccionei, normalmente é este o procedimento."</p>	<p>" Projetos novos no online precisamente mais explicativos, o fact checking, o polígrafo, essas coisas mais de enquadramento." ; " Não, não sei se essa plataforma é importante ou se os próprios órgãos de comunicação social se apercebem dessa necessidade, eles próprios criam as suas próprias ferramentas para não, não sei responder." ; " Contextualização, trabalhos mais longos, com mais grafismos explicativos, com mais análise, se calhar de especialistas daquela área, depende."</p>
Televisão	Jornalista	<p>" Que é que eu tenho em consideração antes de sair para o terreno? Tenho que saber o que é que vou fazer? Que material preciso? Com quem vou sair? Se tenho carro? As condições atmosféricas?"</p>	<p>" Eu acho que vai ser mais pela simplificação dos equipamentos usados." ; " Jornalistas a pegar num telemóvel ou numa câmara sozinha e pôr à frente dele em cima de um tripé. E sozinho estarem a fazer o direto." ; " Por isso, o medo é sempre a primeira reação."</p>		

Televisão	Jornalista		<p>"Não acho necessariamente que acho que quando nos distribuímos por várias funções, não conseguimos ser bons a todas dilui se a qualidade. Eu acho que pode haver uma simbiose de nos esforços de juntar um programador com um jornalista. ; " Não, não há informação objetiva, não há, não há um enquadramento histórico, não há verificação de factos. Eu acho que por mais algoritmos que existam e alguns já ajudam a verificar os factos, eu acho que, personificação ou a figura humana do jornalista não pode ser substituída nesse aspecto, até por essa aproximação humana."</p>	<p>" Agora NPS? É um programa que fica para edição de imagem Google e os SIG tes das notícias. Eu não tenho processo sim, sobretudo sim. Depois não uso muito ferramentas elaboradas. Ana são as aplicações de jornais normalmente, mas para mim, para as minhas funções não."</p>	<p>" Eu acho que há software de verificação e em tempo real de factos com cruzando base de dados jornalísticos ou de organismos públicos cuja informação seja pública, ou seja, naquela tecla ou naquela palavra, possa clicar juntando ali uma expressão e que aquilo me deu uma verificação automática de que sim." ; " Eu acho que neste momento, a maior defesa que precisamos em termos de ferramentas tecnológicas é esse filtro que, a par do jornalista, garante autenticidade à informação."</p>
Televisão	Jornalista	<p>""Eu acho que a RTP já vai fazendo a transposição daquilo que passa no ar nos noticiários. Para RTP play exatamente é não só é também para o site da RTP, sem ser RTP play para a parte das notícias e nos vídeos, todas as reportagens são cortadas e postas lá em fragmentos mais pequenos. No fundo, o tamanho das próprias peças."</p>	<p>" Eu acho que lá está com os noticiários, vão ter que sofrer uma adaptação, Não sei se é já mas acho que será a médio prazo também não posso dizer a curto prazo. Acho que daqui a 2 anos o nosso noticiários vão ser iguais daqui a 3 vão ser iguais. "; " Outra abordagem sobre determinados assuntos, se calhar não pode ser aquele registo de peça. Se calhar vais ser uma coisa mais à base do grafismo, onde se cruzam mais dados. É essa transposição que dizes provavelmente irá acontecer, porque o vídeo será mais curto e mais apelativo."</p>		<p>" Maneira, eu acho que isso é uma informação, uma plataforma que podia dar jeito na redação se eu tivesse que apontar alguma que de certa forma fizesse falta. É, eu acho que poderia ser uma plataforma de, uma espécie de biblioteca que pudesse ser consultada com informação confirmada com informação credível e que nos pensar dar jeito no decorrer de alguma no contexto de uma peça."</p>

Televisão	Jornalista	" Até porque neste caso o nossos canais são de informação e a informação está sempre em atualização, digamos assim. É faz com que tenha sempre uma emissão, tenha sempre alguém."		" Seriamente caso o nome da aplicação ou da automação que me chama que é o itx, basicamente é uma folha de Excel. Com várias linhas em cada linha corresponde a um evento a temos os diretos, temos as publicidades, os exploradores, as promoções. A cada qual tem o seu tempo e basicamente nós usamos depois um rato para fazer o técnico, que é sair do jornal para entrar na publicidade."	
Televisão	Jornalista	" Temos acesso hoje muito mais, a informação na palma da mão, do que tínhamos há poucos anos. Hoje é banal nenhum de nós minimamente atualizado em termos tecnológicos, está à espera de uma tarde ou das 8 da noite para saber quais são as notícias mais relevantes do dia. Não há ninguém que chegue ao jornal da tarde."			

Televisão	Jornalista	<p>" E, portanto, querem absorver a informação muito rapidamente e sem ter de perder muito tempo a olhar para um todo de um jornal televisivo. É quando um jornalista tiver de construir essas narrativas, pode ter de ter alguns conhecimentos que neste momento não tem e algumas ferramentas que neste momento não tem." ; " TSF, público, diário de notícias, JN, correio da manhã, sábado, portanto, sábado é a revista da visão, uso todas elas, e, portanto, diariamente eu procuro informação em todas elas e desde logo para o meu próprio enriquecimento do ponto de vista do conhecimento do mundo." ; " Muitas vezes procuram informação também lá fora, leio às vezes a Globo e vou muitas vezes a páginas de jornais espanhóis e, portanto esse tipo de plataformas eu uso as sempre, redes sociais particularmente o Twitter enquanto enviado especial, porque é muito engraçado perceber uma coisa, as redes sociais têm função do contexto onde nós estamos."</p>	<p>" Por uma migração ou migração não é a palavra correta, é convergência de ecrãs com o ecrã on line com um ecrã de computador a com um ecrã. " ; " Do meu ponto de vista, a internet é a televisão terão necessariamente de convergir e o que é preciso arranjar ferramentas e formas de migrar a narrativa televisiva para a narrativa online."</p>	<p>" Eu utilizo todas as ferramentas digitais que a RTP coloca ao meu dispor." ; "É todo o tipo de material que posso encontrar nas plataformas digitais. Estou a lembrar me concretamente de por."</p>	<p>" Múltiplas ou outras plataformas outras bases de dados seriam sempre úteis." ; " Uma coisa que já me ocorreu em mais do que uma vez, é a existência de uma espécie de polígrafo da verdade em relação às principais declarações diárias dos principais intervenientes nos jornais televisivos."</p>
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Televisão	Jornalista	<p>"Basicamente, nós temos um repositório, que é o play onde temos todos esses programas, tudo que é programação de informação ou programas de entretenimento." ; " É nos dispositivos móveis lê se muito mais, mas isso é o que está toda a gente a fazer." ; " É apesar de estarmos encharcados de informação, pois chegamos sempre ao fim do dia e ficamos a pensar, mas o que é que aconteceu de facto importante no mundo hoje. É isso só realmente se nos sentarmos a frente de um televisor e esse é o papel do jornalista." ; " Noticiários, não os noticiários não são pensados só para os leitores os noticiários são pensados para toda a gente. Tem que dar para os públicos todos. Eu acho que às vezes é que se mistura." ; " Os jornalistas estão a tentar aproveitar o trabalho que eles fazem, que é profissional e estão a tentar aproveitar o trabalho dos amadores, só que muitas vezes com a pressa aproveitam o que é verdade e o que é mentira."</p>	<p>" É É depois tenho um programa de tecnologia que se chama Tech Net." ; " De transmitir às pessoas que ferramentas é que existem e que aí é no fundo perceberem o que é o jornalismo do que aquilo que não é o jornalismo, porque a grande confusão é essa é que há cada vez mais mensagens que se aproveitam do formato jornalístico para ganharem credibilidade quando de facto não o são." ; " O meu projeto de doutoramento, o inicial tinha dito, era exatamente isso, era criar uma plataforma que pudesse fazer essa ligação." ; " Uma ligação com os espectadores utilizadores." ; " O que eu dizia, o que nós estamos a viver neste momento, o momento que há uma grande confusão está tudo uma grande confusão, as coisas estão as utilizações ao jornalista."</p>	<p>"OK, que é no meu smart Phone ou no meu computador, eu quero ver em maior detalhe as notícias que me interessam com mais cuidado ou aprofundar aquilo que aconteceu."</p>	
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Televisão	Jornalista	" antes, enquanto estou a tomar o pequeno almoço, já vi as primeiras páginas dos jornais."; " Não podemos fiar nos a 100% na Internet e temos sempre que cruzar informações e por isso coelho é a velha situação de telefonar para as nossas fontes e tentar perceber o que é que aconteceu, também ajuda depois a cruzar com essa informação que recebemos muito rapidamente através da internet." ; " Por isso por mais tecnologias que possam haver, eu privilégio muito as fontes e porque acabam sempre por ser mais fidedignas porque é dito diretamente à TI não é?"		" É pois são esses mesmos os instrumentos que eu utilizo mais e para além do microfone. Quando estou lá é falar fora da reportagem da câmara, mas isso é utilizada pelo colega."	
Televisão	Jornalista	" Em primeiro lugar tem que haver um interesse jornalístico, não é isso, é fundamental e depois também temos que ver aquilo que é interessante para televisão ou não é, não é a determinadas coisas que podem ter algum até que nos usam."			
Televisão	Técnico de Som	"Agora as pessoas ouvem música no spotify ou na Amazon music. Já ninguém compra discos que aconteceu às editoras."	" Sim olha curiosamente eu acho que não vai mudar muito, ou seja, vai mudar muito e portanto vai haver uma porcaria tecnológica em termos. O que muda é o output, ou seja o que muda é, portanto, dos o esta emissão." ; " Seja passa pelo processo de codificação e depois vai para a rede. O que muda, na verdade é para além de uma tecnologia que vai desta REGI, portanto, ou seja, a repara está REGI passa a ser mais pequena."		
Radio	Produtora	" Pronto e limitações, quer dizer, nós temos limitação. Nós temos que nos cingir no fundo ao que o jornalista quer. Portanto ele diz nos o que quer e nós dentro do que ele quer, não podemos fugir muito disso."	" Vai durar e vai durar por muito. Costumo da rádio sempre."	"Portanto nós temos um programa que é o NPS."	

Radio	Jornalista	"É preciso ter opções editoriais e há sempre quando se tomam opções, Há sempre a opção da proximidade." ; " A notícia é sempre uma coisa importante que acabou de acontecer."			
Radio	Jornalista		" Acho que a rádio tem um futuro larguissimo, porque a rádio também se está adaptar. É essa que é o trunfo." ; " Tudo isto somado, a rádio está viva e bem viva, está adaptar se também às novas tecnologias que nós quase que de 6 em 6 meses do ano, vá lá temos sempre já meios de gravação de transmissão diferentes, portanto, também é um desafio constante." ; " A evolução das coisas, a evolução da tecnologia e a rádio está a adaptar se tal como os próprios profissionais. Desde que como digo a tudo se mantenha na essência. Não vejo mal nenhum, até acho muito bem."		
Radio	Jornalista	" Eu acho que o jornalismo de investigação é uma coisa que nunca vai acabar e ainda bem que não vai acabar." ; " É um dos pilares básicos da democracia." ; " vem do Facebook vem dos Twitter vem de todo o género Internet e alguns site que existem apenas para repetir aquilo que temos muitos sites de informação que funcionavam assim." ; " Ou possíveis, como há também aquelas fontes que nós sabemos que nos dizem coisas, mas que nós não vamos saber se é verdade ou mentira, porque pela experiência que temos é as vezes que contactem as pessoas conseguimos saber se elas estão a dizer coisas por interesses pessoais por vontade de querer fazer um bocadinho mais de barulho para promover."	" Em todas as plataformas, se consegue ver e em qualquer lado é portanto o futuro vai ser digital, vai ser a internet, vai ser a rádio online, vai ser a TV online." ; " É só o digital e portanto é para aí que vamos caminhar. Isso não,não tenho grandes dúvidas. O futuro está na internet."		

Radio	Jornalista	" Foi sempre assim. Os meios continuaram a surgir, portanto, passamos para o folhetim para o jornal, para a rádio, para a televisão."	"Eu acho que o futuro da rádio estão das pessoas onde é evidente que a tecnologia terá o seu papel também mas o futuro da rádio é aquilo que as pessoas quiserem." ; " O futuro do jornalismo depende também do futuro do jornalismo da rádio depende muito do futuro da própria rádio, não é evidente."	" Nos programas que eu que nós utilizamos. Sei, eu acho a maior parte das vezes os programas. São melhores e têm mais coisas do que aquelas que nós somos capazes de fazer, ou seja, nós usamos como o nosso ... uma ínfima parte."	" A criação de algoritmos e.....melhor procura de dados. A nível online portanto, ter mais informação ...linha."
Radio	Jornalista		"Eu acho que a rádio sobrevive é contínua a ser aquele que tem mais esforço até junto das audiências."; " Eu acho que este é o momento da transformação e da mudança e andamos todos um bocadinho perdidos."; " Eu acho que de todos continuo achar que de todos a rádio é o que tem mais possibilidades de subsistir, tal como conhecemos, não acabará."		
Radio	Jornalista				"Estava viva e um exemplo concreto, quando está a ver as peças sonoras tem muita informação. Às vezes quando nas reportagens de campo tem muita informação para ouvir. Bastava um software que possibilita se dizer no momento da gravação. Colocar, por exemplo, uma marca."

Radio	Técnico		" A rádio tem que adaptar os conteúdos e dar às pessoas aquilo que elas querem ouvir."	" Hoje em dia, com as tecnologias que há e nós temos que aproveitar as tecnologias a nosso favor, nomeadamente o whatsapp, o Facebook, nós conseguimos estar em constante comunicação com um jornalista que está na redação com um correspondente que está no Brasil com o que está, por exemplo um jornalista de desporto que vai para a Suíça para acompanhar um jogo."	" Sim ou, por exemplo, o exemplo do whatsapp, que foi uma tecnologia que apareceu algum tempo." ; " Eu acho que sim, que era uma mais valia."
Inovação	Técnico	" É, mas sim, eles a informação, buscar o digital. Provavelmente vão buscar ao Facebook ou alguma coisa do género. Não vejo assim muitos jovens a irem para sites de jornais de referência. No caso português, sei lá, o público, o jn, o expresso." ; "Uma hora a meio hora a ver uma reportagem do jornalismo de investigação ou têm menos a não ser que seja uma coisa bombástica, não é muito posta de uma forma."	"..... bem se tem que se cativar, ou seja se tem que se mudar alguma coisa no conteúdo para cativar mais as novas gerações ou se tem que se educar as novas gerações para perceberem a necessidade de terem determinados conteúdos. Eu acho que é mais por aí."		

Inovação	Técnico	<p>" É assim eu acho que essencialmente o jornalismo digital não é diferente do jornalismo audiovisual ou do jornalismo de imprensa. Eu acho que um é que é um complemento, que é uma evolução natural, mas do trabalho do jornalista não vejo de que forma é que poderá ser diferente. Pronto, o senhor fez num filme, não percebi a pergunta, sim, mas." ; " É agora considerando estes meios estas plataformas digitais, como um dos grandes acervos, que acaba por ser grande propósito que, como, eu como to? Nós vamos ver se calhar notícias na internet não propriamente ver televisão." ; " Eu acho que é sobretudo a forma como nós olhamos para aquilo que é o jornalismo hoje em dia porque se nós estamos olhar para o jornal." ; " Não tenho responsabilidade editorial, ou seja, se Erro ortográfico que eu acho que é um erro ortográfico." ; " Eu deixei de ler o jornal. Porque é um jornal editorialmente direita completamente enviesado." ; " Enquanto o jornalista de investigação é único tipo de jornalismo que tem capacidade abstrata, intelectual e conceptual para fazer para formular uma notícia."</p>	<p>" O design também é as duas coisas combinadas é muito poderoso. Eu acho que vai passar pelo vídeo, pelo youtube, pelas redes sociais que utilizam, o vídeo como ferramenta."</p>	<p>" E existem, ou seja, naquilo que diz respeito ao jornalismo, naquilo que diz respeito ao grafismo de informação, existem templates." ; " Daí existir balizas do que são templates que são editáveis e que estamos a falar desde mapas a templates de dados, a templates de citações." ; " Fotográfica mente às vezes é redondante, mas aqui aplica se porque é para mostrar em gráficos a notícia sim."</p>	
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Inovação	Técnico	<p>" Posso dizer uma coisa que não é assim, não é responder exatamente à tua pergunta, mas que é uma coisa que me preocupa no jornalismo atual é bastante questão económica é a possibilidade de ele ser viável."</p> <p>; " Se calhar em relação a outros, eu, o que vou eu fazer, é fazer um fact check, mas acho que há muito poucas pessoas que o fazem, mas que essa alguma coisa que me interessa eu fico."; " Eu acho que é extraordinariamente relevante, mas eu acho que infelizmente ele está quase desaparecido." ; "</p> <p>Realmente no jornalismo de investigação, muita coisa podre neste mundo seria descoberta que se."</p>	<p>" Esta adaptação às novas tecnologias, digamos assim, este afastar pensando na edição de um jornal de papel. Não é que cada vez há menos. Já são muito poucos para se pensar já dez anos atrás, desapareceram imensos jornais, desapareceram nas redações." ; "</p> <p>Aquele é o polígrafo. O polígrafo que realmente é uma coisa interessante é faz imenso, faz todo o sentido nos tempos em que vivemos." ; "</p> <p>Desenvolvimento de blockchain e pronto, não vamos ver agora por esse lado, mas tenho bastante receio que ainda haja mais substituições nas redações por um computador, por uma máquina basicamente." ; "</p> <p>A cyber ativismo" ; A questão da cibersegurança a todos os 3 exemplos que me deste, a tecnologia blockchain pode trazer tudo isso, seja que não tem necessariamente de estar relacionado com a dark web."</p>		
Inovação	Técnico	<p>"Eu não consulto muito. Portanto, não se a par de muitas novidades."; "</p> <p>Neste caso, informações através do facebook, onde aí claramente o acho que esses algoritmos são. Somos nossos países e são, existem as pessoas todas com uma única direção na cabeça. Eu acho que isso é perigoso."; "</p> <p>Tem vindo a ser apenas com aquele feed news que tu tens no telemóvel." ; Tu estás a consumir aquele já quase como entretenimento ou já sem pesados o valor moral das coisas."</p>	<p>" A ferramenta humana que propriamente Informação. Para já a responsabilidade tenta ser mais na margem era possível."</p>		

Inovação	Técnico	<p>""Para mim é o jornalismo, a informação, a investigação, o que for. É acima de tudo tenho que para ser credível, para ser bem executado, para ser, em última instância consumido com qualidade. Tem de ser mesmo acima de tudo, tem de dar condições ao jornalista para ter uma vida normal."; " Depois obviamente que também tem a ver com a plataforma em si quer seja uma televisão, uma rádio, uma página de facebook, um site, o que for. Que eu acho que o caso da RTP é. É se fosse um cenário edílico, seria para mim a melhor situação para se trabalhar como jornalista."; " Eu acho que o jornalismo de dados por si só é uma ferramenta muito útil, mas sozinha. Acho a perigosa no sentido em que."</p>	<p>"Maior facilidade que existe em criar plataforma se há agora uma maior facilidade para criar plataformas de informação maior desinformação." ; " Menos fontes de informação, porque vai haver grandes aglomerados de médias. Exemplo CMTV, TVI , pronto o grupo."</p>	<p>" Ou seja, por exemplo, uma tabela de excel. vem que sim, mas de uma forma mais simplificada e eventualmente isso faz todo o sentido, até porque muitas vezes uma tabela com números. Não é a forma mais fácil de encontrar um determinado dado que tu."</p>	<p>"Eu diria que o valor de 1 minuto por causa do instagram começa a ser uma coisa."</p>
Inovação	Técnico	<p>E disse de uma forma muito direta que a informação vai ser sempre a mesma. É a recolha de notícia pego na notícia, transmite a notícia, não vai haver mudança."</p>	<p>"" Paradigma de meios de transmissão e comunicação."</p>	<p>" Obviamente, qualquer ferramenta é sempre útil. Obviamente, quando falamos em ferramentas hoje em dia estamos a falar em ferramentas informáticas porque de certeza absoluta que ele não precisa de uma foice no martelo, nem uma enxada nem de uma pá e literalmente de um software e isso é sempre útil."</p>	

Inovação	Técnico	" Porque independentemente do meio a informação, ou seja, o trabalho jornalístico, tem que existir sempre, seja para um canal de youtube, seja para um twitter, seja para o que for." ; " É depois os jornalistas, por exemplo, que deveriam ter insenção, são traídos pela própria, pela imensidão e proliferação de meios de comunicação, seja ele o facebook, seja o que for, seja a própriamoda."	" Isso faz me lembrar aqueles gajos também os detetives que fazem investigação e que metem num quadro com pines, as caras dos suspeitas e os dados e as ligações." ; " A forma da rádio é da televisão concorrer com os formatos digitais de forma desvinculada, ou seja, rádio, televisão, se quiser continuar no comboio, vai ter que integrar,. As novas narrativas na televisão, ou seja, vamos ter que ver whatsapp e afins." ; " O futuro do jornalismo não me parece assim muito. A verdade é que a informação jornalística é muito fraca Os jornalistas."	"Eu tenho um projeto, por exemplo, em photoshop para cada cenário, para cada pedido, nas qual vou alterando ou adequando os dados, seja para photoshop, seja para as ter."	
Inovação	Técnico	"Olha por exemplo eu estive ajudar a RTP memória a procurar efemérides . não sei se já estiveste alguma vez na página de Facebook da RTP memória, todos os dias eles assinalam 3 ou 4 efemérides daquele dia." ; " É acredito que nunca se deixe, ou seja, que nunca se vá abdicar deste jornalismo tradicional."			
Inovação	Técnico	" É acho que ainda existe demasiada informção, melhor, que não tem qualidade, tipo, não é focada, ou seja, ainda se anda muito à volta do assunto, mas sem procurar." ; " Eu prefiro o digital." ; " Tu agora não vês televisão , tens uma netflix, tipo, tu não vés um jornal, vais à Net e consultas o sapo."	"Acho que passa pela. Por isso que estavas a querer fazer que é toná lo atrativo e isso é espetacular. Coisa é coronavirus."	" Eu sei que há coisas que ajudam bastante na minha área, ajudam muito a comunicar, o visitarmos todos interligados, seja num programa de decomposição de vídeo, não é em que cada um está a fazer a sua parte e juntam todos. É um só, isso é perfeito."	" A ferramenta é que vai definir se estás a fazer uma coisa boa, ou seja, se ferramenta não é boa, mas a ferramenta portanto, é a notícia também é assim."

Inovação	Técnico	" Assim é essencial, eu onde vejo fundamentalmente conteúdos informativos e online mais do que televisão e de rádio é jornais. E por isso é absolutamente essencial e acho que tem um caminho para fazer. O que aconteceu à bibliotecas aqui há uns anos, que as pessoas achavam que , como já estava tudo disponível em todo o lado, que as bibliotecas já eram dispensáveis, até que se começou a perceber que as bibliotecas e os bibliotecários são mediadoras de informação. A quantidade de informação é tão grande, é aí as fontes diversas e por vezes pouco creíveis, também são tantas que se não houver um mediador, as pessoas com facilidade caem na informação falsa ou não consomem informação."	"O que eu acho é que o caminho está acima dos jornalista, propriamente. Acho que quem dirige tem aqui uma função muito mais importante de credibilizar do que propriamente os jornalista, porque nos jornalistas confiamos à partida."		" O jornalista é o mediador, é a pessoa que tem capacidade de receber uma grande quantidade de informação, selecionar o essencial, pôr o essencial disponível para o consumidor e caso o consumidor queira saber mais profundamente, há de aparecer alguém que trabalhe em jornalismo de investigação aquele assunto, se for caso disso. Para mim é um mediador tal e qual como bibliotecário, tal é qual o bibliotecário para mim é essencial."
Inovação	Técnico	" Sei lá, informação tem o mesmo lugar que todo o resto, tipo de conteúdo, acho eu." ; " Informação agora que eu acho é que a informação que está a acontecer, é a questão da cerda de ser superficial."	" Acho que o futuro é negro, porque tu passa essa falta de imparcialidade não é, seja por que motivo seja." ; " Pois, sabem mais do que nós. Também existem algoritmos que consegues fazer o discurso de outra."		" Mas o Excel blower não é mais do que que um, vamos dizer, é um sabor no caso, mas no teu caso, para queres ir a uma base de dados ou fazer cruzamento de dados, ou seja o que for, tens que ter alguma coisa que estimule isso."

