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**FAKE NEWS: CHARACTERIZATION OF DIFFERENT
INDIVIDUAL PROFILES IN RELATION TO
DIFFERENT NEWS TOPICS**

Maria Francisca de Sousa e Alvim Lima de Barros

Dissertation presented as partial requirement for obtaining
the Master's degree in Information Management

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Instituto Superior de Estatística e Gestão de Informação
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by

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Dissertation presented as partial requirement for obtaining the Master's degree in Information Management, with a specialization in Information Systems and Technologies Management

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To Avó Guidinha and Avó Triz.

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ABSTRACT

The existence of fake news is an extremely topical concern which calls into question the veracity of the broadcasted information. Since nowadays the search and production of news is mainly done online, the costs with content production are low and the content's reach and speed of propagation is very high. These factors facilitate the dissemination of fake news in social platforms that are not specialized means of communication, namely in online social networks. Therefore, this study aims to characterize different profiles of Portuguese individuals based on their susceptibility to several news topics. The attainment of the mentioned profiles is going to be a valuable contribution to information management and it is going to allow future definition of measures to mitigate the propagation of fake news in social platforms. To achieve this, critical literature review was done and accompanied by the creation of a survey to analyze how academic background and topic of the news pieces influence the accuracy of individuals identifying false news. This dissertation intends to understand if there is anyone immune to fake news, or if individuals can be more or less immune depending on the topic.

KEYWORDS

Fake news; Social Network; Opinion Dynamics; Social Interventions; Detection

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LIST OF ABBREVIATIONS AND ACRONYMS

STEM	Science, Technology, Engineering and Mathematics
ANOVA	Analysis of Variance
MANOVA	Multivariate Analysis of Variance
ACC.	Accuracy
KNOW.	Knowledge
COMPR.	Comprehension
TEC.TER.	Technical Terms
INT.	Interest
VAG.	Vagueness

1. INTRODUCTION

This dissertation aims at study the factors underlying dissemination of fake news. In particular, we analyze how the academic background and the topic of the news piece influence the accuracy of individuals to accurately identify the falsehood of the content. The study was conducted in a population of Portuguese nationals when presented with news headlines in Portuguese. The specific research questions are the following:

1. The fact that a piece of news is truth or false has an effect on accuracy identifying the news as true or false? Does being a true or false piece of news reflects on respondents' previous knowledge of the news and comprehension? Does it reflect on perceived use of technical terms, vagueness or respondents' interest in the news?
2. The category of the news (e.g., Sport, Science, Culture, Health) has an effect on classifying news accurately?
3. Does an individual's background – academical and professional - influence his sensitivity to false news?

Misinformation is dangerous and, as we have been experiencing in recent years, can easily spread throughout populations, affecting our opinions about social sensitive topics and influencing political debate. It is directly connected to the rise of fake news dissemination. The concern with the quality of information disclosed and used in decision-making process led us to develop this study, since this is a critical issue for information management.

There are not many studies on the interaction of Portuguese people with fake news. This makes it a topic with great room for research. Living in Portugal increases interest for this analysis and allows to understand better the attitudes in our landscape.

To study the behavior of Portuguese population in relation to true and false news, this dissertation provides a review of the recent research conducted on the topic of fake news, covering several definitions of fake news and the role of social media as an enabler of their dissemination. Moreover, we contribute with a better understanding of the reasons that might lead people to spread false news as true information, by exploring how their academic background and the topic of a piece of information (e.g., Sports, Economy, Science, etc.) might interact and affect the ability of individuals to discern true from

false news stories. This research was done by surveying a group of 194 Portuguese individuals and assessing their sensitivity to fake/true news headlines. We considered respondents' background, usage of social media, and frequency of news shared on social networks. In total we analyze the answers of 194 individuals, controlling for the respondents' previous knowledge, comprehension and interest of the news presented. The perceived use of technical terms and vagueness of the news was also studied.

This dissertation intends to shed a light on the Portuguese individuals' behavior towards spread of fake news and enhance the importance given to the veracity of information. Moreover, our contribution aims to understand how different groups of individuals react to several true and false news stories. By understanding in which categories of news Portuguese people have more difficulty distinguishing true from falsehood, and if academic background has an impact on accuracy classifying news, it is going to be possible to contribute with a characterization of different profiles of Portuguese individuals. This is a valuable contribution to information management, which can be used in the long term to reduce the spread of fake news.

2. LITERATURE REVIEW

2.1. HISTORY – FALSE NEWS ARE NOT A NOVELTY

The spread of false news is not new (Posetti and Matthews, 2018). However, in recent years due to its societal impact it got renewed attention and it is regarded as one of the most pressing issues of our days (Nielsen et al., 2020) Indeed, it is widely accepted that false news played a decisive role in defining the outcome of both during the Brexit referendum of 2016 (Kucharski, 2016, Greene et al., 2021) and the American election of 2016 (Grinberg et al., 2019), and might have been used in the later as an instrument deployed by foreign interests. In that sense, it is not surprising that in recent years the spread of false news has been widely studied (Shao et al., 2017, Saad et al., 2019, Zhang et al., 2019, Vo et al., 2020, Hameleers et al., 2021).

Past works recognize false news as dangerous for society (Rapp et al, 2018) and propose a several guidelines for detection systems. Conroy et al. (2015) uses linguistic analysis combined with machine learning methods and network-based behavioral data in order to assess the veracity of information. Wang (2017) developed a large data set of labelled short statements to facilitate the train of automatic fake news detection algorithms based on linguistic patterns. Vaidyanathan (2020) presents different strategies developed by several social scientists in order to slow the chains that disseminate misinformation. In this research paper, the strategies chosen depend on whether the individual was not yet or has already been exposed to inaccurate information. If the contact with misinformation has not yet happened, there is still a chance to immunize individuals by utilizing games or training videos. Even though the best strategies to halt spread of misinformation are widely studied topic, there is still no ideal solution to this problem. The spread of false news remains a very dense problem, and one with numerous possible dimensions and variables to be studied.

Here we use data collected from a questionnaire deployed among the Portuguese population to identify whether individuals of different academical backgrounds reveal different sensitivity to fake news of different topics. Our contribution aims at characterizing different profiles of Portuguese individuals based on their susceptibility to different news topics, studying their behavior towards true and false news. With the characterization of different profiles, it is going to be possible to assess the dissemination of false news and define measures to mitigate its propagation among Portuguese population. Therefore, it is going to be possible to improve the quality of information distributed.

2.2. FALSE NEWS DEFINITION

False news are commonly referred as fake news. There are several different definitions of this term. Fake news are overall characterized as false information (Allcott, H., & Gentzkow, M., 2017; Shu et al., 2017; Gentzkow et al., 2018; Lazer et al., 2018; Vousoughi et al., 2018). Some literature adds that for a news piece to be considered as fake news, it is necessary that the information is intentionally false (Allcott, H., & Gentzkow, M., 2017; Shu et al., 2017). The purpose of the information is also taken into account in some definitions: it is considered that fake news intend to deceive (Lazer et al., 2018) and are used to persuade individuals with misleading facts (Zhang et al, 2019). The literature also highlights other characteristics of fake news: its uncertainty, big volume and the fact that they are spread in real time (Zhang et al, 2019). Besides that, it is considered that its content resembles the form of news media, but its intention does not (Lazer et al, 2018).

In this study, the emphasis is going to be placed in the accuracy of information and not in the intention behind the content assessed. Therefore, and for objectivity purposes the term that is going to be used is *false news*, in contrast to *true news*.

2.3. IT IS STILL A CURRENT TOPIC – PARADIGM SHIFT

The exposure to news on the internet – both in social media and online official news sources - represented a shift in the way individuals have access to information. Even though nowadays social media is one of the primary sources of news consumption (Epstein et al., 2019), online social media is used for several different purposes other than to access reports of recent events. It is where individuals spend most of their time online (Perrin, 2015) and they use it to communicate with others, express and share feelings, opinions and thoughts. This is done within virtual networks of connections.

Since individuals get information through online social networks (Turcotte et al., 2015), it can be considered that it is potentially going to influence the way people form and discuss opinions. So, if individuals are exposed to misinformation online, their perspectives are going to arguably be shaped by such information. Therefore, the dissemination of false news is a current topic.

2.4. SOCIAL MEDIA AND ITS CHARACTERISTICS THAT ENABLE THE SPREAD OF FALSE NEWS

Social media has several characteristics that carry advantages for online news providers. In comparison with traditional media, the cost of entry in the online media market is very low, which allows the entry of

several new players (Lazer et al., 2018). Therefore, the cost of content production is also very low so practically anyone can create and broadcast any form of content. With online media, there is a possibility of a direct path between who produces and who consumes the content, leading to a higher reach. For example, when considering an online news piece on social media, it is more likely it will have a high outreach and propagation speed due to the ease of content creation and dissemination. Hence, in order to be considered a news provider when creating a website to broadcast information online there is no need to be compliant with journalistic norms. In most cases, all that is required is an apparently credible website to which online traffic can be drawn to. Some social media websites are already considered reliable sources of information as for example Twitter. According to Cha et al., 2010, it is considered as a “*news spreading medium*” (p.11), apart from being considered a major social network.

Social networks also have mobile adapted websites and apps. This fact not only allows users to access it via their mobile devices, but also encourages them do it. The flexibility in the access to information is enhanced, which translates into a big reduction of time of public opinion generation and diffusion (Zhao et al., 2014).

Several hypotheses on how false news spread have been advanced. One hypothesis is that the spread of false news is associated with the formation of several clusters composed of users with a shared system of beliefs (Del Viccario et al., 2016). However, opinions between different clusters tend to polarize. Social media, such as Facebook, are considered to have a specially suited environment for the emergence of polarized communities. A particular case of these communities are the so-called echo chambers (Del Viccario et al., 2016). These are communities where individuals blindly feedback all opinions that are spread inside the community. The community’s emotional behavior is influenced by user involvement inside the echo chamber. In this way, it was identified that individuals with a higher involvement have a higher propensity to express negative emotions when commenting on different topics. It is easier that a less active user has a slower shift towards negative interactions than a more active one. (Del Viccario et al., 2016). In this homogeneous groups, people are isolated from contrary views to their own.

Some literature suggests that social bots can be responsible for dissemination of false news. They can attack individuals in a social network in order to pursue one of several different goals, as for example, the spread of information. Since social bots are automatic or semi-automatic computer programs that impersonate humans and/or human behavior (Wagner et al., 2012), anyone with a bot can increase the

spread of a piece of information just by liking and sharing it. The dissemination of information done with a bot has a wider scale when compared to the dissemination done by a standard individual account. In this case, and when the use of social bots in online social networks aims to boost the diffusion of a piece of false news in online social network, social bots are considered a mean for spread of false news.

It is also possible that the network to which an individual belongs is responsible for his exposition to misinformation. Past works have studied how the spread of information in social networks is conducted through relationships between users. Thereby, this kind of networks have their distinctive propagation rules where user behavior – its activity and influence, for example – is a driving force of public opinion dissemination and the relationships between users are acknowledged as a communication channel (Zhao et al., 2014). Cha et al. (2010) claims that the direct links in social media determine the flow of information and indicate a user's influence on other users. Thereby, social media can be considered a biased environment for content consumption – especially when considering news as content - since what one gets in their feed is dependent on several factors such as friends and connections in the network. Thus, content liked or shared by friends is possibly going to be information displayed in one's social media personal feed, alongside with other content delivered based on user online behavior. If a false or misleading news article is shared by someone it is likely that it is going to reach its connections' feeds, causing the spread of misinformation. In contrast, if an individual does not share nor react to a false news article, it is likely that the information never reaches individuals part of his network. The previous literature focusses mainly on how users influence other users online. Moreover, the information that someone is exposed to when online is certainly going to influence his behavior and opinions expressed in and outside of social media. However, this offline influence is still not widely studied, and it is also very hard to quantify and gather the necessary information for its analysis.

Another way of analyzing the spread of public opinion is with resource to epidemiologic models. This approach is also used by Bettencourt et al. (2005) who argued that the diffusion of ideas would hold several qualitative similarities to the spread of infections. Jin et al. (2013) uses epidemiological models for characterizing information cascades on Twitter that had its origin in news and rumors. This was the first time this kind of models were applied to a social network, which is characterized for having a large data set and by being where stories can develop in real time. Zhao et al. (2014) proposed a public opinion propagation model on social networks based on studies previously developed by Bettencourt et al. (2005) taking in consideration the social networks' unique features. Then, in the same way public opinion or

spread of ideas can be studied according to an epidemiological model, the spread of false news can also be analyzed with the help of similar methods.

As stated above, the mainstream spread of false news can be enhanced mainly online by diverse factors such as the natural characteristics of online media, the individuals that are part of one's network, the formation of homogeneous and polarized groups in social media, as for example echo chambers, or by use of social bots.

2.5. WHY IS THE SPREAD A PROBLEM?

As evidenced by Vosoughi et al. (2018) when studying the diffusion of true and false stories distributed on Twitter, falsehood diffuses farther, faster, deeper, and more broadly than the truth regardless of the category of information. Even though the influence is hard to quantify or define specially, in the medium or long run the exposition to misinformation will naturally impact on individuals' beliefs (Lazer et. al., 2018). So, this suggests that a piece of false news in an online social network is going to spread faster than any true piece of information and impact people who encounter it.

Although the quality of the information is considered as a more and more important issue (Buntain, C., & Golbeck, J., 2017) and true is central for the good functioning of life in society, the spread of misinformation online is increasingly common. This wide dissemination of false information represents a serious threat to general trust in the mass media.

The exposition to false news is problematic for society, because individuals are going to base their views, values, and ultimately their decisions in the falsehood they are exposed to. Hence, taking false news as true represents a problem since it leads to inaccurate beliefs and causes partisan disagreement over several issues that can even be basic facts (Pennycook et al., 2019). Hence, the spread of false news is a problem and should be taken into consideration as a great concern in society and its study is currently a crucial key-issue for information management.

During the global pandemic, misinformation has been a constant. The risk remains identical: individuals will take false information as a basis to decide (Vaidyanathan, G. 2020). In a pandemic, it is even more likely that the actions based upon false information endanger everyday life.

2.6. WHY DO INDIVIDUALS BELIEVE IN FALSE NEWS?

The question remains: why do people believe in false news? Bond & De Paulo (2006) suggest that humans are not so good detecting lies on text: the findings support that people are only 4% better distinguishing true from false statements than if they decided it randomly.

In contrast, Pennycook et al. (2019) disagrees with this “post-truth” narrative, and instead argues that people are not aware of the fact that they are sharing misinformation on social media in the moment they decide to share it. The study states there is a disconnect between sharing intentions and accuracy judgments. In other words, there is a dissociation between the content individuals consider accurate and the actual content they share on social media. The findings point out that the problem is just distraction from accuracy when sharing content. When asked, the majority of participants in an experiment they conducted said it is important to only share accurate news. Thus, even though people can distinguish true and false information, they won't take the information accuracy in consideration when sharing it. Instead, the focus is set on other motivations, such as willingness to please followers, engagement with specific content or even to show to their network that they belong to a specific group. Therefore, sharing false pieces of news does not indicate per se that the individual believes in this information. It is possible that he is only distracted from the accuracy of the content.

The fact that a piece of news is considered true or false by an individual might also be affected by social norms or by the relation with the individuals' beliefs (Del Viccario et al., 2016). Several studies conducted show that individuals prefer information that supports their pre-existing attitudes. By doing this, people show a confirmation bias, which means that the information coherent with their own beliefs is perceived as more convincing than discordant information. Humans also have a desirability bias, i. e., they are drawn to accept information that is more socially acceptable or desirable and therefore satisfies them (Lazer et. al, 2018).

The repetition of the same information – across several platforms or throughout different connections in the network, for example – must be considered when studying the belief in false news. Individuals are more likely to accept information that is repeated as true (Swire et al., 2017).

People are also going to be drawn to information that supports their psychological motives, as it can happen when considering the belief in conspiracy theories. They are explanations for important events that involve secret plots by powerful and malevolent groups (Goertzel, 1994). Conspiracy theories are also

usually speculative and contradictory, consider the public ignorant and subjugated to unaccountable powers. (Douglas et. al., 2017). Individuals are driven to believe in this apparently unbelievable content when it promises to satisfy one's desire for understanding, accuracy, subjective certainty or other social motives.

Conspiracy theories are considered false news and the motives which draw people to conspiracy belief can be the same that draw people to false news. The epistemic motives behind conspiracy use causal explanations to reduce uncertainty when information available is conflicting, try to find meaning when the events are apparently random and can defend beliefs from refusal. This human desire for understanding and accuracy can lead to using conspiracy theories to protect one's beliefs when facing uncertainty, contradictions, or even when there is no information available (Douglas et. al, 2017). The belief in a conspiracy theory may be stronger when the events considered are particularly significant and leave individuals dissatisfied with small explanations. (Leman & Cinnirella, 2013). The dissatisfaction can lead to a belief in false information since it may fulfil the above referred individual motivations. It is also possible that beliefs in conspiracy theories are grounded in social motives, namely in the desire to belong and maintain both a positive image of oneself and of the groups' one belongs to. In the same way people could be drawn toward conspiracy theories that seem to affirm or validate their political views, individuals can be attracted to misinformation that favors their political position.

The aforementioned factors drive conspiracy belief. But it is still not clear if the beliefs in conspiracy scenarios fulfil these motivations. (Douglas et. al., 2017).

Social homogeneity is another factor which can reinforce a belief in false news. Usually, individual beliefs lean towards an alignment with the values of the community that he is part of. (Lazer et. al, 2018). When aggregated in homogeneous clusters it is easy that individuals may select and share content that related only to a particular plot, ignoring what does not align with it. Consequently, these communities enhance opinion polarization based mainly in false narratives, such as rumors or conspiracy theories. (Del Viccario et al., 2016).

2.7. HOW CAN THE SPREAD OF MISINFORMATION ONLINE BE REDUCED?

There are several studies developed on how to reduce the spread of false news online. Lazer et. al (2018) proposes two different categories of strategies for minimizing the spread of false news. First, they aim to awake one's critical awareness by helping to identify false news based on an evaluation of the information

encountered. This could be achieved through exposition to fact checked pieces of news, for instance. However, this is considered hard because most individuals will only question the credibility of the information if it violates their beliefs or preconceived ideas (Vo et al., 2020). Second, it is suggested that structural changes on social media can prevent the exposure of individuals to false news in the first place (Lazer et al., 2018). Thus, the highlight given to information with credible sources should be maximized so that an accurate source would be a requirement for a trending information. Social media sites such as Facebook already partner with external fact checkers certified through International Fact-Checker Network to identify and review false pieces of news. Nonetheless, it is still not enough because several kinds of advertisements and published pieces cannot be vetoed.

A different perspective argues that drawing social media users' attention to the concept of accuracy can lead to a reduction of the amount of misinformation they share. That is suggested because individuals who are able to determine the accuracy of the content are distracted from it in social media, focusing their attention on other aspects. In addition, social media platforms are designed for quick scroll and engagement with several types of content and may not invite users to participate in critical thinking. Therefore, just by highlighting accuracy or even the techniques used to spread misinformation, users can be more aware of its veracity when sharing content (Maertens et al., 2020).

There is also literature that focuses on the role of users considered hubs in the network, who consequently work as information brokers. Hochreiter et al. (2013) uses previous studies to suggest that human interaction is organized in small-world networks that define how persons are linked to each other. A small-world network has several specific properties and is characterized by the fact that it is possible to connect any two vertices among the network just through a few links (Amaral et al., 2000). In this way, in a small-world network a few individuals connect most individuals. The ones who establish most connections work as hubs, being the connection's brokers. (Hochreiter et al., 2013) Therefore, in an online social network if a "hub" individual filters false information and does not post it, he can make his network more robust to false news. Likewise, if a user spreads truthful and accurate information, there is a high probability that it is going to reach other individuals' part of his network.

Social influence can have a significant role in the reduction of misinformation online. It is described as the process where individuals adjust their opinion and change their behaviour or beliefs as a result of a set of social interactions with other individuals (Moussaïd et al., 2013). It is a crucial element in forming public

opinion. Social influence suggests that interactions between individuals are highly responsible for each individual opinion. In an online social network, the elements of a users' network are going to influence his views and the news that he is exposed to. Consequently, a change of friends or followers can make the system more robust to false news.

Considering that individuals do not exist isolated from society and are part of different networks of persons, social science presents three factors to explain how individuals assimilate information. Social contagion is one of these factors and argues that one absorbs information through a network (Törnberg et al, 2018). However, not all behaviours in a social network spread directly from one person to another. For an individual to adopt a behaviour, it takes reinforcement of the same behaviour by several people (Vaidyanathan, G. 2020). In addition, one's worldview is substantive when considering how individuals agree with information. Culture, beliefs and life experience have a great deal of influence on how someone reacts to a given piece of news. Individual perspective and worldview influence what is taken as true and false, and this can be one of the reasons why fact checking alone is not efficient to fight misinformation. People perceive their views as something they cannot let go in order not to jeopardize their social circle status.

As mentioned before, the way to fight misinformation is much more complex than providing individuals with true information and hope it is going to be chosen over false information (Vaidyanathan, 2020). This difficulty in fighting misinformation is proven by the fact that even though the spread of fake news is a widely studied theme, the concrete problem prevails, and individuals engage daily with several false pieces of news.

This dissertation project is designed to study the factors subjacent to the dissemination of false news. The aim of this thesis is to analyze how individuals' background – academic and professional and the topic of news impact the accuracy of individuals identifying false news.

This dissertation is done under the hypothesis that no one is immune to fake news. What happens is that individuals are more susceptible to believe and take false news from certain topics as true. The accuracy identifying falsehood might also be affected by factors such as relation with an area of expertise, social norms or individuals' beliefs. Moreover, humans take easily the information they get from social media, most times without wondering about its accuracy (Pennycook et al., 2021). It is not only social networks that lead individuals to believe in false news, but oftentimes it is the people who are part of one's network.

Thus, the people who connect with an individual can be responsible for his exposition to misinformation (Balmau et al., 2018). Ensuring that a network is composed of persons with different sensitivity to different news categories can be a strategy to make a group of individuals more robust, and therefore it is more difficult to spread fake news.

The survey was developed to test the following research questions:

[RQ1: The fact that a piece of news is truth or false has an effect on accuracy identifying the news as true or false? Does being a true or false piece of news reflects on respondents' previous knowledge of the news and comprehension? Does it reflect on perceived use of technical terms, vagueness or respondents' interest in the news?]

We have the perception that the fact that a piece of news is true or false influences how individuals characterize it accurately as true or false. As hypothesis, a piece of news veracity reflects has an impact on previous knowledge of the news, interest and ease of comprehension. Being a true or false new story also influences readers' perceived use of technical terms and vagueness.

[RQ2: The category of the news (Sport, Science, Culture, Health, Economy, Society, Politics) has an effect on classifying news as accurately?]

Since individuals do not have the same amount of knowledge or awareness regarding different topics, it is likely that they react distinctly when confronted with news regarding different themes. Thus, with this research question it is aimed to test if the news topic impacts an accurate classification of news headlines as true or false.

[RQ3: Does an individual's background – academical and professional - influence his sensitivity to false news?]

Additionally, individuals' background – age, education, professional experience – influences how information is perceived. Consequently, this hypothesis was formulated to test if one's background influences sensitivity towards false pieces of news.

With this study, we expect to find if:

- Individuals identify more accurately true or false news.

- Portuguese people accuracy identifying if a piece of news is true or false is related with their previous knowledge of the story, interest, perceived use of technical terms or vagueness of the story.
- There are specific factors or characteristics - for example age, level of education or overall use of social media - that influence Portuguese individuals' critical sense in relation to different topics of news.
- Academical and professional background has an effect on accuracy classifying the veracity of news.

3. METHODOLOGY

In this section is presented the methodology employed to carry out this study. In the first place, a critical review of existing literature was done. The previous literature and research were used to define some of the theoretical concepts in the basis of this dissertation. The research available was used in order to understand the scope and relevance of the problem under study and its relationship with existing knowledge.

To complete the information collected when developing the literature review, a questionnaire destined to the data collection was designed and built.

A questionnaire is a written tool that presents its respondents with a series of questions or statements, so that they answer by selecting one of the response options or by answering openly (Brown, 2001). Therefore, the questionnaire is a structured interview, where each respondent answers to questions in a previously organized form (Brace, 2008). The series of questions must be organized identically for all respondents (Chiromo, 2006).

Questionnaires carry several advantages such as low data collection costs, possibility to reach geographically distant locations and a high number of individuals. The absence of a bias due to the absence of the interviewer can also be considered as an advantage (Magwa & Magwa, 2015).

Through the analysis of the information collected, it is going to be possible to characterize several groups of people considering their behavior in relation to different topics of news.

The questionnaire is going to present several news titles to respondents. Titles are a highly distinctive factor when distinguishing false from true news pieces. Generally, the title holds the piece of news's main argument and allows readers to skip the full article. Thus, false news are targeted to individuals who will not read beyond the title (Horne, B., & Adali, S., 2017).

The news were extracted from Portuguese fact-checker website *Polígrafo* and subsequently validated by the researcher in order between 1st of August 2019 and 28th of February 2020.

3.1. STUDY DESIGN

The study was approved by NOVA IMS Research Ethics Committee and complied with all ethical aspects. The questionnaire (Appendix A) was developed as part of the study to analyze the susceptibility of

different groups of Portuguese people in relation to different topics of news. Hereby, the study is targeted to Portuguese citizens and Portuguese native speakers and was deployed in June 2020.

The questionnaire was designed with three parts. In the first part, there was an introduction to the study. Respondents consented to participate in the study and were presented with a set of questions regarding one's background and social media usage. The second part presented 14 different pieces of news which respondents classified as true or false and indicated whether they knew the news previously or not. Between the second and third parts of the survey there was a question used as an attention check (for more see Appendix G). Ultimately, it was not utilized in the analysis since was considered too tricky and conservative. The third part contained a comprehension analysis, done through seven different pieces of news.

The questionnaire was designed to target Portuguese nationals and therefore entirely written in Portuguese.

3.1.1. SURVEY PART ONE – INTRODUCTION

In the first part of the questionnaire, respondents were introduced to it with a welcome message (Appendix A) which explained the questionnaire objectives, its average duration and the requirements to participate in the study. The questionnaire welcome message informed that to be part of the survey it was required to be Portuguese or fluent in Portuguese and over 18 years old. To participate in study respondents had to give their consent.

Thereafter, respondents were asked about demographic background data: year of birth, gender, district of residency, last level of education concluded, profession and current area of work. In case respondents stated that their profession was "Student", they were asked about their area of specialization rather than their area of work. To study social media usage and online influence, the first part of the questionnaire also included questions about social media utilization. Participants were questioned how often they used social media and which social networks they used among the following: Facebook, Instagram, Twitter, LinkedIn and Reddit. For each social network selected, participants were questioned about how many friends, followers or connections they possessed. Lastly, participants were asked how often they shared news on social media.

3.1.2. SURVEY PART TWO – ACCURACY AND PREVIOUS KNOWLEDGE

To understand how Portuguese people perceive the accuracy of different topics of news it was required to develop the second part of the questionnaire. It started with the following message:

Now, I would ask you to classify as true or false several news distributed by Portuguese media in recent months.

Each respondent was presented to a set of 14 different pieces of news. Following each piece of news, respondents were asked two questions: *is this piece of news true or false?* and *did you already know this piece of news?* If the respondent answered he already knew the news article, he was asked *what was the source that informed you about this piece of news?* To answer this question, the given options were via *mass media (newspapers, magazines, television, social media), told orally by someone else, or other.* In this last option, respondents could type to specify the source.

To create this section of the questionnaire, three groups with 14 titles of news were developed (for more see Table 1). Each group consisted of two news from each category – Science, Health, Culture, Sport, Society, Economics and Politics. From the two pieces of news in each category, one was true and one was false. Therefore, each respondent encountered seven true and seven false news stories, displayed in a randomized order.

Table 1

<i>News Presented to Respondents During the Survey</i>		
category	type	news
Science	True	The closest black hole to our planet, which is a thousand light years away from Earth, has been discovered.
Science	False	A study by Harvard scientists concludes that carrying weapons reduces crime.
Culture	True	In 2017, 200 thousand euros of public funds were spent to promote the tauromaquia culture so that it could be classified as Immaterial Cultural Heritage of Portugal under the UNESCO Convention.
Culture	False	Leo Fender, the creator of the well-known Fender guitars, was a talented guitarist.
Health	True	The Constitution of the Portuguese Republic does not allow mandatory hospitalization in case of contagious diseases.
Health	False	Between 1950 and 2020, China was at the origin of nine different epidemics - H2N2, H3N2, H5N1, SARS, avian flu, swine flu, swine fever, Coronavirus, Covid-19.

Sport	True	Following Football Leaks, Manchester City was suspended for two years from Champions League.
Sport	False	According to the British newspaper Daily Mail, FC Porto is third in the list of the most corrupt clubs in European soccer.
Economy	True	Social Security paid 4 million euros to pensioners already deceased.
Economy	False	Nelson de Sousa, Minister of Planning, is correct in saying that Portugal is a leader in the execution of European funds.
Society	True	Jair Bolsonaro supports a measure that wants to force Brazilian prisoners to bear their expenses during the time they are serving their prison sentences.
Society	False	In Portugal there has never been a condemnation for racial discrimination.
Politics	True	Graça Fonseca, Minister of Culture, went to give a speech to Santa Casa da Misericórdia a day after her company signed a 19,600€ contract with the institution.
Politics	False	André Ventura denies that Chega is a racist party, given that in the Lisbon District Organ there are two black women dealing with cleaning.
Science	True	A study by the Faculty of Medicine of the University of Coimbra and the Nova Medical School indicates that two out of three Portuguese adults are vitamin D deficient.
Science	False	The FBI has released a list of the Zodiac signs most likely to commit crimes.
Culture	True	None of the Beatles' elements could read or write music on the staff.
Culture	False	José Saramago said, "Portugal doesn't have right-wing, left-wing parties, it has a bunch of scoundrels who gather to steal together".
Health	True	In the Philippines, a baby with only 29 days is the youngest victim in the world to die because of Covid19.
Health	False	Drinking one glass of red wine a day is equivalent to doing one hour of physical exercise.
Sport	True	Dejan Lovren, a Liverpool player, argues that Covid19 is being propagated to force the world's population to vaccinate themselves with drugs that are going to implant microchips.
Sport	False	UEFA suggests that the allocation of places in European soccer competitions in 2019/20 be made in accordance with last season's final classification.
Economy	True	The proposed amendment to the State Budget made by PSD which provided for a 21.7% reduction in ministerial office expenses was rejected.
Economy	False	In Portugal, the average amount of the Social Integration Income benefit is fixed at around 800 euros.
Society	True	An IPSS in São Pedro do Sul was fined for providing support to six more people than was authorized.
Society	False	The Lidl supermarket chain offers 500€ shopping cards to anyone who answers an online questionnaire.

Politics	True	Despite not having political representation in the Portuguese Parliament, Livre will continue to receive a public subsidy of 165 thousand euros per year during this legislative term.
Politics	False	In 2015 the PSD Government recorded the highest public deficit ever at 10.9%.
Science	True	A study led by Columbia University (USA) warns that in some places on the planet global warming is generating combinations of humidity and heat that can be potentially fatal to humans.
Science	False	In February 2020, 500 scientists signed a letter to the UN arguing that there is no climate emergency.
Culture	True	Bruce Springsteen's "Born in the USA" was the first CD to be produced in the United States.
Culture	False	Black Friday had its roots in slavery since in the last Friday of November black slaves were sold at a discount in order to boost the economy.
Health	True	In October 2019 an event in New York City brought together several international entities to analyze how they would respond to the outbreak of a global pandemic.
Health	False	The medication against depression results in side effects that imply new substances to compensate the effects of the previous ones, creating a vicious cycle of medicine dependence.
Sport	True	The total number of FC Porto victories in the Champions League is more than double the number of victories of SL Benfica.
Sport	False	Benfica won the 2018/19 Portuguese league with a total of 103 goals. This was the first time a team scored more than 100 goals during the championship.
Economy	True	In Portugal, women's wages are on average 14.5% lower than men.
Economy	False	Joseph Stiglitz, winner of the Nobel prize for economics, says that if Portugal does not leave the Euro, "it is condemned.
Society	True	The Covilhã municipality acquired and offered thermographic cameras worth 4 thousand euros to institutions that are on the front line against Covid 19, which cannot be used to measure the temperature of people.
Society	False	Greta Thunberg has publicly lied about her age.
Politics	True	The Minister of the Environment, João Matos Fernandes, lied about the loss of European funds due to the suspension of the Lisbon's circular subway line.
Politics	False	Decriminalizing euthanasia was not part of any of the Portuguese parties' electoral program in the 2019 parliamentary elections.

3.1.3. SURVEY PART THREE – COMPREHENSION OF NEWS HEADLINES

The third part of the questionnaire was designed to analyze respondents' comprehension of different news. This section started with the following message:

Next, we are going to show you some more news. For each one we are going to ask you four questions.

After the initial message, seven different news items were presented to the respondents. The news were displayed in a randomized order and belonged to one of the two sets of 14 pieces of news which was not presented to the respondent when answering to the previous part of the questionnaire. Therefore, we guaranteed that respondents had no previous contact with these news during the questionnaire.

It was necessary to classify each news item considering four distinct aspects using numerical scales from one to six. First, respondents rated ease of comprehension from very much difficult (1) to very much easy (6). Secondly, respondents classified the news item regarding use of technical terms from none (1) to very much (6). Thirdly, respondents declared their interest in the piece of news from none (1) to very much (6). Lastly, the vagueness of the news story was rated from very much concrete (1) to very much vague (6). Respondents assessed if it was a detailed and concrete or an abstract and vague piece of news.

The study occurred from 8th June 2020 to 6th July 2020. The survey was distributed mostly via email, Facebook and WhatsApp. Most responses were reached through private messages and personal networks. In particular, through a network of Portuguese universities composed by a Portuguese business school, an information management school and a technical university.

The selection criterion used to be considered as part of the survey was a completion rate above 50%. Thus, a total of 194 participants were considered. From the total sample of 194 participants, 175 answered to 100% of questions presented.

4. STUDY RESULTS AND DISCUSSION

4.1. DESCRIPTIVE ANALYSIS

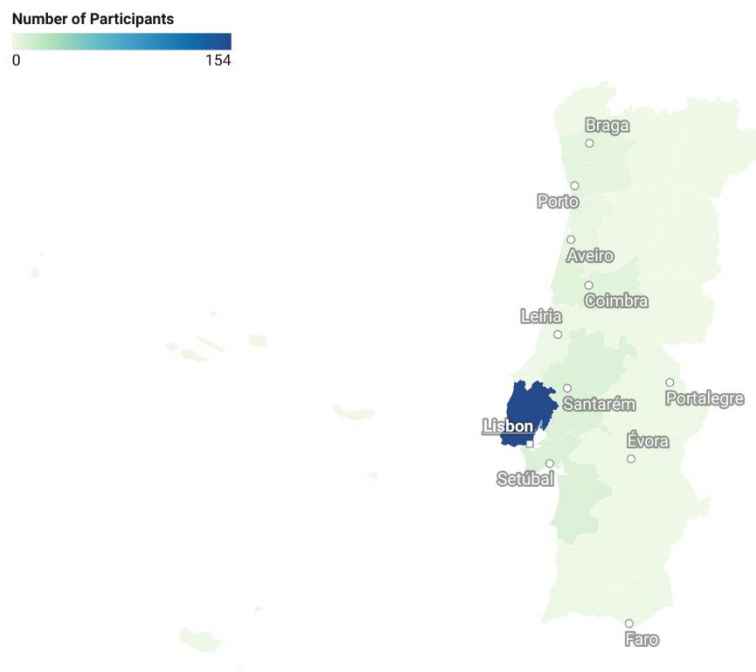
4.1.1. STUDY PARTICIPANTS

Participants' ($N = 194$) age ranged from 19 to 97 years as of 11.02.2021. The sample age range was dispersed, and the average respondent age was 37.13 years ($M = 37.35$ $SD = 17.59$). When considering respondents gender, 115 are female (59.3%) and 79 are male (40.7%).

Study participants reside in eleven different districts in Portugal: Aveiro, Braga, Coimbra, Évora, Faro, Leiria, Lisboa, Portalegre, Porto, Santarém and Setúbal. Most respondents live in Lisboa, making it the district with the highest representation with 154 respondents (79.4%). It is followed by Setúbal with 9 respondents (4.6%), Santarém with 8 respondents (4.1%), Coimbra with 6 respondents (3.1%), and Porto and Braga, both with 5 respondents (2.6%). For more information see Figure 1 below.

Figure 1

Distribution of Respondents by Area of Residence

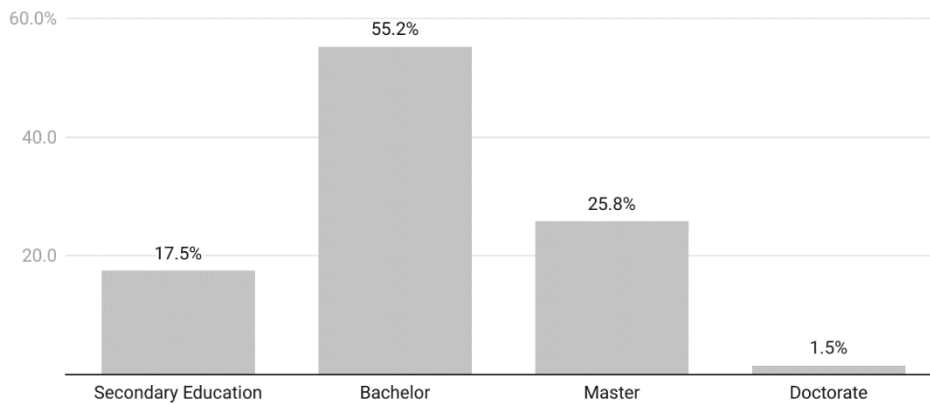


Note. The map has data collected in the survey.

To test how different backgrounds – one’s professional experience, circumstances and education - could influence perception of different topics of news, participants were asked about their qualifications. Overall, participants education level was high, as displayed below in Table 2. A total of 160 participants (82.5%) hold a university degree: 107 participants (52.2%) completed a bachelor’s degree, 50 participants (25.8%) obtained a master’s degree and 3 participants (1.5%) hold a doctorate. From the total sample, 34 participants (17.5%) concluded secondary education.

Figure 2

Participants’ Education Level



Since individuals are not only affected by their academic background, but also by their experiences and environment, the background study also included information about profession, area of specialization and current field of work.

Respondents' professions are displayed in Appendix C. Although it is a quite diverse sample, the most prevalent professions are Student (65 respondents, 33.5%), Engineer (25 participants, 12.9%) and Teacher (12 respondents, 6.2%). Some engineers detail their area of expertise while others do not mention a specialization. There are also 10 participants not active in the labor market - from these, four report no profession (2.1%) and six respondents are retired (3.1%). Overall, five respondents are managers (2.6%) and four are consultants (2.1%). Five respondents (2.6%) pursue careers related with Arts – Actress, Architects and a Designer.

If respondents identified themselves as students, they were asked about their area of specialization instead of being asked to specify an area of work. Respondents' area of studies is displayed in Appendix

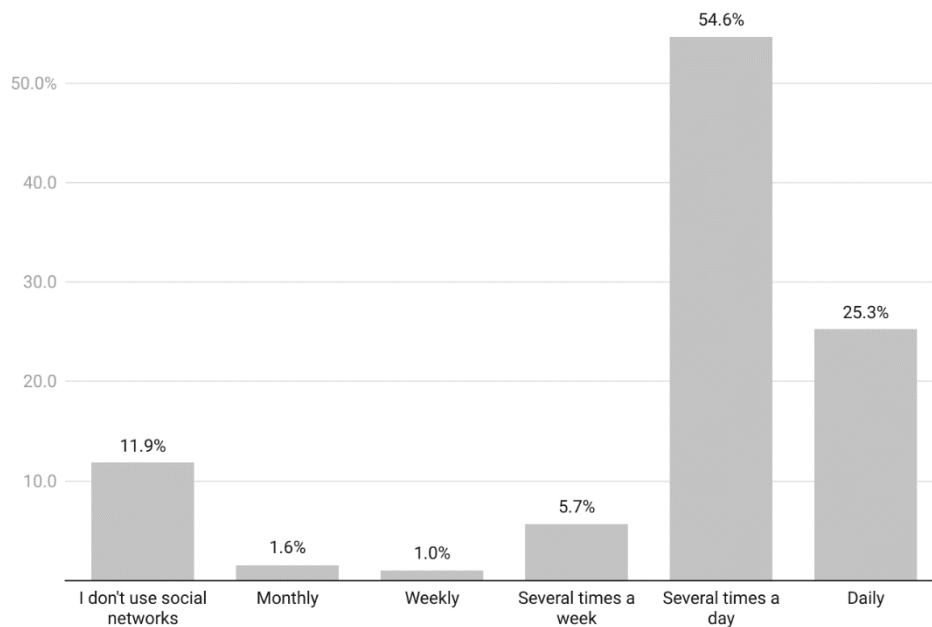
D. Overall, the fields of studies with more respondents were Business (14 respondents, 21.5%), Health (10 respondents, 15.4%), Engineering (9 respondents, 13.8%) and Law (five respondents, 7.7%). Most students – 42 respondents - were enrolled in STEM fields of studies, in contrast with 19 students in non-STEM fields. Four students did not identify any area of study.

It was requested to the 129 respondents who were not students to identify their area of work as presented in Appendix E. Respondents' field of work was broad and diverse. The fields of work with more respondents were Education, with 16 respondents (12.4%), IT with 9 respondents (7%) and Marketing with five respondents (3.9%).

When asked about their social media usage, most participants utilize it several times a day as displayed on Figure 3 below. 106 participants (54.6%) access social media several times a day. Overall, 49 participants (25.3%) indicate that they use social media daily. Additionally, 11 participants (5.7%) use social media several times a week and two participants (1%) use it on a weekly basis. Only three participants (1.5%) use social media monthly. Lastly, 23 participants (11.9%) report that they do not use social media.

Figure 3

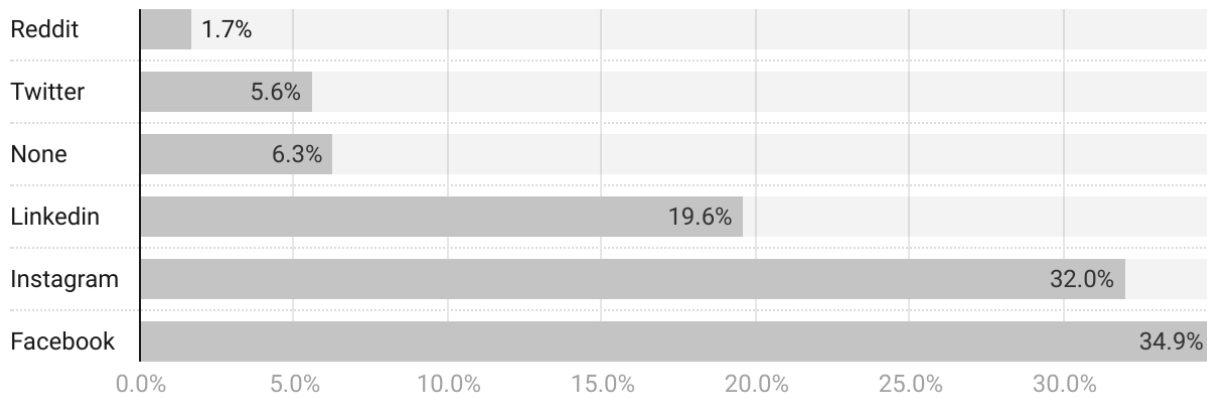
Participants' Frequency of Use of Social Networks



Apart from being inquired about their social media usage frequency, participants were also asked which social networks they utilized. Facebook was the most used social network (144 participants, 74.23%), followed closely by Instagram (132 participants, 68.04%) among its users. LinkedIn was used by 81 participants (41.75%), being therefore the third most widely used social network. Twitter and Reddit were the two less used social networks, being used by 23 (11.86%) and 7 (3.61%) participants, respectively. For more, see Figure 4.

Figure 4

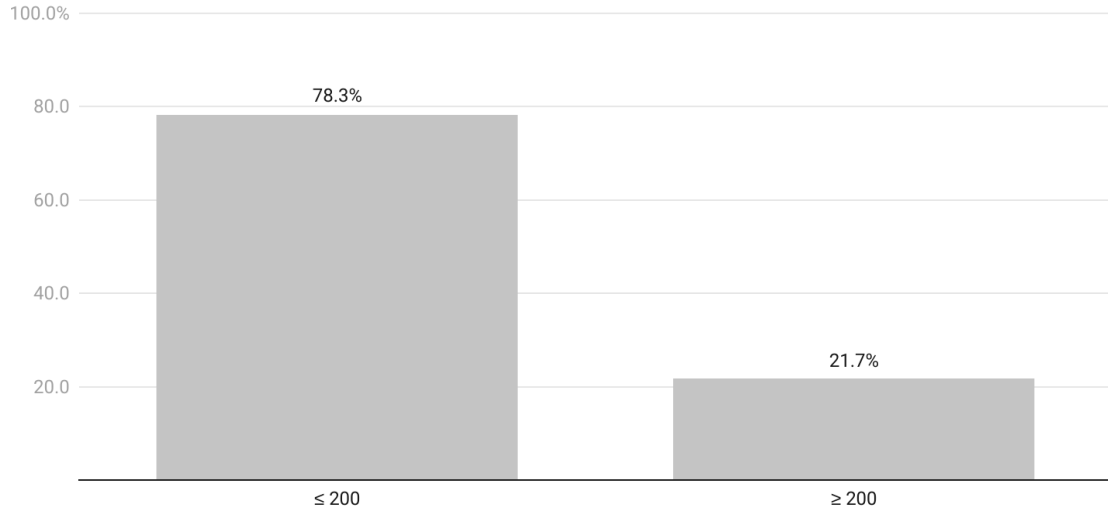
Respondents' Use of Social Media



From all social networks, Twitter and Facebook were the only two social media sites mentioned in this thesis previous analysis of literature. Therefore, we will analyze participants' number of Twitter followers and Facebook friends with more detail. For more on Twitter followers, see Figure 5.

Figure 5

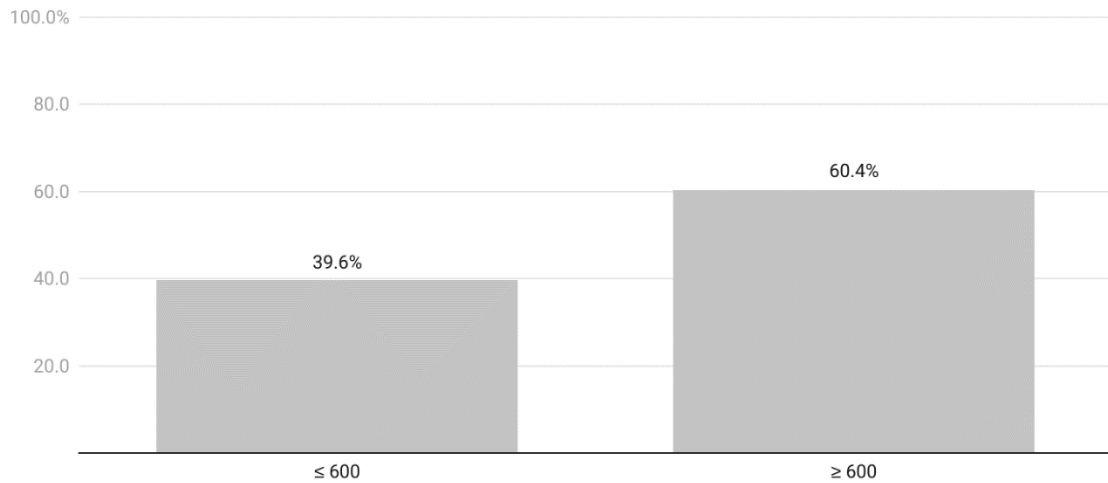
Participants' Number of Twitter Followers



Most study participants (78.3%) who use Twitter have between zero and 200 followers. Only 21.7% of participants with a Twitter account have more than 200 followers. Considering Facebook, the trend is reversed. Most of participants in the study (60.4%) have more than 600 followers, while the minority of respondents (39.6%) has less than 600 followers.

Figure 6

Participants' Number of Friends on Facebook



In order to understand respondents' potential impact in their networks, respondents were asked about how often they shared pieces of news on social media. Most respondents (130 respondents, 67%) share news online with their connections. Among these, three respondents (1.5%) shared news on social media several times a day, 10 respondents (5.2%) declared that they shared news daily and 15 respondents (7.7%) shared news several times a week. In addition, 25 participants (12.9%) shared news weekly on social media, 51 participants (26.3%) shared news with a monthly frequency and 26 participants (13.4%) share news on a yearly basis. Conversely, 64 respondents (33%) declared they never share news on social networks.

For study purposes the participants were divided in two groups according to both their academical and professional background: STEM ($n = 87$) and non-STEM fields ($n = 95$).

4.1.2. RESPONDENTS PERCEPTION OF NEWS HEADLINES

After answering questions about background and social media usage, respondents classified pieces of news as true or false, identified if they were previously aware of the news and analyzed several features of the news pieces.

In this work we focus on the analysis of the following six features:

- **Accuracy**, given by the ratio between the number of respondents who classified accurately the piece of news as true or false by the total amount of respondents who classified the piece of news during the survey.
- **Knowledge**, computed from the fraction of the number of respondents who already knew the piece of news presented in the questionnaire and the overall number of respondents to that question.
- **Comprehension**, obtained by the mean of an overall score on a scale from one – *very difficult* - to six – *very easy*. The score was awarded by each respondent, considering the piece of news in question.
- **Use of technical terms**, given by the mean of an overall score to classify the use of technical terms in a piece of news on a scale from one – *none* - to six – *very much*. Each participant who faced the piece of news was required to assign a score.

- **Interest**, obtained by the mean of the score attributed by each respondent. This score referred to respondents' interest in the piece of news, with scores ranged from one - *none* - to six - *very much*.
- **Vagueness**, computed by the mean of the score given by each participant to the piece of news. News were classified as concrete and detailed or abstract and vague using a score ranged from one - *very concrete* - to six - *very vague*.

Overall, respondents could classify accurately the pieces of news ($N = 42$) presented in the questionnaire ($M = .63$, $SD = .19$). Furthermore, most respondents didn't know previously the news presented in the study ($M = .24$, $SD = .12$). The piece of news which most respondents were already aware before participating in the survey was recognized by 64% of respondents, while the least known news story was recognized by only 5% of respondents.

Apart from observing accuracy classifying news as true or false and gathering information about the previous knowledge of news, respondents' comprehension of the pieces of news was additionally analyzed.

In general, respondents considered news easily understandable ($M = 4.80$, $SD = .43$). Participants considered that pieces of news had an average usage use of technical terms ($M = 2.52$, $SD = 0.64$), even though this feature was the lowest-rated comprehension indicator. The interest displayed by participants in the several pieces of news was fairly high ($M = 3.40$, $SD = .76$). When classifying vagueness, participants tended to find the news slightly towards a vague and abstract piece of news ($M = 3.03$, $SD = .51$). For more see Table 2.

Table 2

Descriptive Statistics for Study Variables

	<i>n</i>	<i>minimum</i>	<i>maximum</i>	<i>M</i>	<i>SD</i>
Accuracy	42	0.29	0.98	0.63	0.19
Knowledge	42	0.05	0.64	0.24	0.12
Comprehension (1 - Very Hard)	42	3.70	5.75	4.80	0.43
Use of Technical Terms (1 - None)	42	1.44	4.11	2.52	0.64
Interest (1 - None)	40	1.70	4.66	3.40	0.76
Vagueness (1 - Very Much Concrete)	40	1.97	4.00	3.03	0.51

The differences classifying true and false news stories regarding Accuracy, Knowledge, Comprehension, Use of Technical Terms, Interest and Vagueness were also analyzed. Descriptive statistics are displayed below in Table 3. Study participants classified false pieces of news more accurately than true news. Overall, respondents score a higher accuracy categorizing false news ($M = .72, SD = .18$) than true news ($M = .54, SD = .17$). When asked if they were familiar with news presented in the study, participants knew more true news ($M = .26, SD = .13$) than false news ($M = .21, SD = .11$). Although false news were considered easier to understand, the difference between false ($M = 4.82, SD = .48$) and true ($M = 4.78, SD = .38$) news stories comprehension was not significant. Respondents considered that the use of technical terms was greater in true ($M = 2.61, SD = .54$) than in false news ($M = 2.43, SD = .73$). Furthermore, respondents showed a slightly greater interest in true ($M = 3.58, SD = .67$) than in false news pieces ($M = 3.23, SD = .83$). Lastly, when facing news in the questionnaire participants considered false news ($M = 3.14, SD = .58$) somewhat vaguer and more abstract than true news ($M = 2.92, SD = .41$).

Table 3

Comparison Between True and False News

	<i>n</i>	True News		False News	
		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Accuracy	21	0.54	0.17	0.72	0.18
Knowledge	21	0.26	0.13	0.21	0.11
Comprehension (1 - Very Hard)	21	4.78	0.38	4.82	0.48
Use of Technical Terms (1 - None)	21	2.61	0.54	2.43	0.73
Interest (1 - None)	20	3.58	0.67	3.23	0.83
Vagueness (1 - Very Much Concrete)	20	2.92	0.41	3.14	0.58

4.1.3. NEWS CATEGORIES

To study respondents' susceptibility to different topics of news, it was analyzed how respondents perform classifying news as true or false in each category and their familiarity with news presented in the study as displayed on Table 4.

The three categories with a higher accuracy perceiving news are Science ($M = .78, SD = .07$), Society ($M = .74, SD = .20$) and Economy ($M = .72, SD = .14$). Conversely, the four categories in which a lowest accuracy is observed are Politics ($M = .62, SD = .15$), Health ($M = .54, SD = .21$), Sport ($M = .50, SD = .16$) and Culture ($M = .50, SD = .21$).

As stated previously, news presented to respondents in the study were not widely known ($M = .24, SD = .12$). News concerning category Health ($M = .33, SD = .10$) were the most known among study participants, followed by news concerning Economy ($M = .28, SD = .18$), Politics ($M = .25, SD = .14$) and Sport ($M = .23, SD = .11$). The three categories where participants were most unfamiliar with the news headlines presented were Science ($M = .22, SD = .11$), Society ($M = .19, SD = .10$) and Culture ($M = .17, SD = .07$).

A comprehension analysis was also developed within the questionnaire. Also in Table 4 is presented how participants perceive the news in the seven different categories considering its overall comprehension, use of technical terms, vagueness and participants' interest in the piece of news.

The most easily understood news belong to the Culture ($M = 5.03, SD = .43$), followed by Sport ($M = 4.93, SD = .40$), Society ($M = 4.85, SD = .54$) and Science ($M = 4.78, SD = .23$). The categories considered harder to understand were Health ($M = 4.72, SD = .36$), Economy ($M = 4.62, SD = .58$) and Politics ($M = 4.57, SD = .36$).

Respondents considered that Economy ($M = 2.87, SD = .43$) was the topic with highest usage of technical terms, followed by Politics ($M = 2.63, SD = .78$), Health ($M = 2.60, SD = 1.02$) and Science ($M = 2.56, SD = .51$). According to study participants, Sport ($M = 2.49, SD = .31$), Culture ($M = 2.34, SD = .42$), and Society ($M = 2.17, SD = .81$) were the topics of news where technical terms were most widely used.

Regarding interest shown in each news categories, respondents displayed highest interest in Politics ($M = 4.00, SD = .38$), Economy ($M = 3.90, SD = .46$) and Health ($M = 3.78, SD = .56$). Science ($M = 3.66, SD = 1.00$), Society ($M = 3.14, SD = .72$), Culture ($M = 2.90, SD = .58$) and Sport ($M = 2.64, SD = .39$) were the subjects respondents considered themselves less interested in.

When asked to classify the pieces from very much concrete to very much vague, participants rated Science ($M = 3.43, SD = .57$), Economy ($M = 3.16, SD = .64$), Health ($M = 3.10, SD = .51$) and Society ($M = 2.99, SD = .31$) as the four more abstract categories. Conversely, the categories considered more concrete were Culture ($M = 2.71, SD = .27$), Sport ($M = 2.88, SD = .55$) and Politics ($M = 2.91, SD = .50$).

Table 4*Descriptive Analysis of the Six Features per Category*

Category	Accuracy		Knowledge		Comprehension (1 – Very Hard)		Use of technical terms (1 – None)		Interest (1 – None)		Vagueness (1 - Very Much Concrete)	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Science	0.78	0.07	0.22	0.11	4.78	0.23	2.56	0.51	3.66	1.00	3.43	0.57
Culture	0.50	0.21	0.17	0.07	5.03	0.43	2.34	0.42	2.90	0.58	2.71	0.27
Health	0.54	0.21	0.33	0.10	4.72	0.36	2.60	1.02	3.78	0.56	3.10	0.51
Sport	0.50	0.16	0.23	0.11	4.93	0.40	2.49	0.31	2.64	0.39	2.88	0.55
Economy	0.72	0.14	0.28	0.18	4.62	0.58	2.87	0.43	3.90	0.46	3.16	0.64
Society	0.74	0.20	0.19	0.10	4.85	0.54	2.17	0.81	3.14	0.72	2.99	0.31
Politics	0.62	0.15	0.25	0.14	4.57	0.36	2.63	0.78	4.00	0.38	2.91	0.50

4.1.4. DESCRIPTIVE ANALYSIS OF THE NEWS

A detailed analysis of each news headline score on Accuracy, Knowledge, Use of Technical Terms, Comprehension, Interest and Vagueness is on Appendix F. In this section, we will present a few pieces of news highlighted in study results.

The news headline respondents' classified more accurately was false and belonged to category Society. It was *"Greta Thunberg has publicly lied about her age"* ($M = 0.98$). Conversely, study participants scored lowest accuracy identifying veracity of a Sport true news story. It read *"Dejan Lovren, a Liverpool player, argues that Covid19 is being propagated to force the world's population to vaccinate themselves with drugs that are going to implant"* ($M = 0.29$).

The most well-known news headline was true and had to do with Economy: *"In Portugal, women's wages are on average 14.5% lower than men"* ($M = 0.64$). Overall, participants were less aware of a true news headline in category Culture *"Bruce Springsteen's "Born in the USA" was the first CD to be produced in the United States"* ($M = 0.05$).

Considering ease of comprehension, the piece of news with a higher rate was the same participants' classified more accurately. It was false and had to do with Society: *"Greta Thunberg has publicly lied about her age"* ($M = 5.75$). The hardest news headline to understand was false and belonged to Politics: *"Nelson"*

de Sousa, Minister of Planning, is correct in saying that Portugal is a leader in the execution of European funds” (M = 3.70).

Both highest and lowest rated news headlines when considering use of technical terms were false and concerned Health. The news story with highest use of technical terms read *“Between 1950 and 2020, China was at the origin of nine different epidemics - H2N2, H3N2, H5N1, SARS, avian flu, swine flu, swine fever, Coronavirus, Covid-19” (M = 4.11).* Conversely, *“Drinking one glass of red wine a day is equivalent to doing one hour of physical exercise” (M = 1.44)* scored the lowest use of technical terms.

Participants’ interest was highest in the most well-known news headline. It was a true news story regarding Economy: *“In Portugal, women’s wages are on average 14.5% lower than men” (M = 4.66).* The news headline participants were less interested in was false and belonged to Science. It read *“The FBI has released a list of the Zodiac signs most likely to commit crimes” (M = 1.70).*

Vagueness was considered higher in a false news headline from Politics: *“Nelson de Sousa, Minister of Planning, is correct in saying that Portugal is a leader in the execution of European funds” (M = 4.00).* This piece of news considered the vaguest and most abstract was the same that displayed a lower comprehension rate. Conversely, *“Benfica won the 2018/19 Portuguese league with a total of 103 goals. This was the first time a team scored more than 100 goals during the championship” (M = 1.97)* was the most concrete news headline in the study. It was false and had to do with Sport.

4.1.5. COMPARISON BETWEEN STEM AND NON-STEM BACKGROUND

When comparing overall survey performance of respondents with STEM ($n = 87$) and non-STEM ($n = 95$) backgrounds, the differences were not greatly significant as exhibited on Table 5. Respondents with STEM backgrounds ($M = .63, SD = .20$) classified more accurately the pieces of news presented than respondents with non-STEM backgrounds ($M = .62, SD = .21$). In the survey, the previous knowledge of news was not significantly different among respondents with STEM ($M = .24, SD = .12$) and non-STEM ($M = .24, SD = .16$) academical and professional experience. The comprehension of the news was slightly easier for participants with non-STEM backgrounds ($M = 4.79, SD = .51$) than for participants with a STEM background ($M = 4.74, SD = .45$). Contrary to respondents who possessed a STEM background ($M = 2.50, SD = .56$), respondents with a non-STEM background ($M = 2.59, SD = .75$) believed that the news had a greater usage of technical terms. There was not a significant difference between the interest of the two groups in the pieces of news, even though STEM respondents ($M = 3.43, SD = .81$) had a highest overall

interest than non-STEM respondents Interest ($M = 3.37, SD = .76$). News vagueness¹ was classified similarly by STEM ($M = 3.08, SD = .51$) and non-STEM ($M = 3.02, SD = .59$) respondents. However, STEM respondents believed news were vaguer and more abstract.

Table 5

Comparison Between STEM and non-STEM Respondents - Descriptive Statistics

Background	STEM			Non-STEM	
	<i>n</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Accuracy	42	0.63	0.20	0.62	0.21
Knowledge	42	0.24	0.12	0.24	0.16
Comprehension (1 - Very Hard)	42	4.74	0.45	4.79	0.51
Use of technical terms (1 – None)	42	2.50	0.56	2.59	0.75
Interest (1 – None)	40	3.43	0.81	3.37	0.76
Vagueness (1 – Very Much Concrete)	40	3.08	0.51	3.02	0.59

In Table 6 below we analyze the accuracy of the participants with different academic and professional backgrounds considering each one of seven news categories. Although the three categories where news stories were rated most accurately were the same for respondents with STEM and non-STEM backgrounds, the order of top three was different.

Society ($M = .78, SD = .19$), Science ($M = .77, SD = .07$) and Economy ($M = .71, SD = .18$) were the categories categorized most accurately by STEM respondents. Conversely, non-STEM respondents were more able to identify accurately news regarding Science ($M = .81, SD = .12$), Economy ($M = .74, SD = .14$) and Society ($M = .71, SD = .22$).

The topics where accuracy classifying news as true or false was lower were different for STEM and non-STEM respondents. Individuals with a STEM background classified worse the veracity of news stories related with Culture ($M = .49, SD = .21$), while the ones with a non-STEM background scored a lower accuracy on Sport ($M = .48, SD = .21$).

Table 6*Accuracy of STEM and non-STEM Respondents per Category of News*

Category	STEM		NON-STEM	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Science	0.77	0.07	0.81	0.12
Culture	0.49	0.21	0.50	0.22
Health	0.52	0.22	0.54	0.22
Sport	0.49	0.14	0.48	0.21
Economy	0.71	0.18	0.74	0.14
Society	0.78	0.19	0.71	0.22
Politics	0.66	0.15	0.59	0.15

In Table 7 the different categories of news were separated into true and false news, to study the behavior of STEM and non-STEM respondents towards veracity of news of various topics.

Respondents with a STEM background classified more accurately false news related with the following categories: Society ($M = .90, SD = .12$), Economy ($M = .81, SD = .07$) and Science ($M = .80, SD = .09$), respectively. When considering true pieces of news, the categories with a highest proportion of accurately classified news were Science ($M = .75, SD = .06$), Society ($M = .66, SD = .17$), and Economy ($M = .66, SD = .17$). For more see Table 7.

Even though the order of news topics identified with higher accuracy is different, respondents with a non-STEM background classify the same three categories with more accuracy as those with a STEM background as displayed in Table 7 below. When a non-STEM respondent encountered false news, the three news topics with a higher accuracy rate were Society ($M = .87, SD = .16$), Science ($M = .82, SD = .09$) and Economy ($M = .82, SD = .09$). If the non-STEM individual faced a true news story, the three categories with a higher accuracy rate were Science ($M = .79, SD = .17$), Economy ($M = .73, SD = .19$) and Society ($M = .55, SD = .14$).

Table 7*Accuracy of STEM and non-STEM Respondents per Category of News on True and False News*

	<i>n</i>	STEM				NON-STEM			
		TRUE		FALSE		TRUE		FALSE	
		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Science	6	0.75	0.06	0.80	0.09	0.79	0.17	0.82	0.09
Culture	6	0.38	0.13	0.60	0.23	0.39	0.14	0.60	0.26
Health	6	0.48	0.11	0.56	0.32	0.52	0.20	0.55	0.28
Sport	6	0.38	0.07	0.59	0.10	0.34	0.15	0.63	0.15
Economy	6	0.60	0.21	0.81	0.07	0.73	0.19	0.76	0.08
Society	6	0.66	0.17	0.90	0.12	0.55	0.14	0.87	0.16
Politics	6	0.66	0.17	0.76	0.14	0.50	0.13	0.68	0.11

4.2. INFERENCE STATISTICS

4.2.1. T-TEST

An independent-sample-t-test was conducted to compare respondents' accuracy classifying true and false news. There was a significant difference in scores for false ($M = .72, SD = .18$) and true ($M = .54, SD = .17$) news stories; $t(40) = 3.24, p < .003$. The results suggest that true or falsehood of news really does have an effect on respondents' accuracy classifying news stories. Specifically, this analysis suggests that when the news presented to respondents were false, they categorized it more correctly.

4.2.2. ANALYSIS OF VARIANCE - ANOVA AND MANOVA

In order to analyze the effect of the groups of true and false news on accuracy classifying news, a one-way ANOVA was performed as detailed below in Table 8. There was a significant main effect of the groups of true and false news on accuracy, $F(1,40) = 10.400, p = .003$. These results suggest that the fact of a piece of news being true or false really does have an effect on respondents' accuracy classifying the news.

Table 8*One-way ANOVA - Effect of News Veracity on Accuracy*

	<i>Sum of Squares</i>	<i>df</i>	<i>Mean Square</i>	<i>F</i>	<i>Sig.</i>
Between Groups	0.317	1	0.317	10.400	0.003
Within Groups	1.220	40	0.031		
Total	1.537	41			

To study the effect of category on respondents' accuracy classifying news as true or false, a MANOVA was conducted as displayed on Table 9. There is a significant effect of the category of the news on respondents' accuracy classifying news, $F(6, 35) = 2.957, p = .019$. The results of the MANOVA indicate that the topic of news has an effect on how news are classified accurately as true or false.

Table 9*MANOVA - Effect of News' Category on Accuracy*

	<i>Sum of Squares</i>	<i>df</i>	<i>Mean Square</i>	<i>F</i>	<i>Sig.</i>
Between Groups	0.516	6	0.086	2.951	0.019
Within Groups	1.021	35	0.029		
Total	1.537	41			

Since MANOVA found significance, it was necessary to conduct post-Hoc tests. A multi-comparisons test statistical analysis was used to examine pairwise differences in several categories as displayed in Appendix D. The only relationship with a pairwise significant difference was observed between Science and Culture.

4.2.3. PEARSON'S CORRELATION

To study the relationship between respondents' accuracy classifying news as true or false and their previous knowledge of the news, interest, ease of comprehension, perceived use of technical terms and vagueness, Pearson's correlation was calculated. True news and false news were analyzed separately. For more on true news, see table 10.

4.2.3.1. TRUE NEWS

Among survey respondents, accuracy classifying true news was moderately positively correlated with respondents' previous knowledge of the piece of news, which was statistically significant ($r = .552, n = 21, p = .009$). Thereby, an increase in respondents' accuracy classifying true news stories indicates an increase in their prior knowledge of the news.

There was a high degree of positive correlation between participants' accuracy categorizing true news stories and their interest on it ($r = .708, n = 20, p = .000$). So, an increase in the accuracy classifying true news suggests an increase in participants' interest on the news stories. Moreover, an increase in respondents' interest also suggests a higher accuracy classifying veracity of news stories.

When studying the relationship between previous knowledge of true news and the other five studied features, Pearson's correlation showed two relationships with positive correlation - between knowledge and accuracy, and between knowledge and interest. There is a moderate degree of positive correlation between the proportion of respondents who knew the news beforehand and accuracy of respondents classifying true news ($r = .552, n = 21, p = .009$). Thus, an increase in participants' previous knowledge of true news implies an increase in the accuracy classifying news as true. Additionally, Pearson correlation suggests a moderate degree of positive correlation between respondents' previous knowledge of true news and interest on it ($r = .569, n = 20, p = .011$). So, the greater the awareness of true news pieces, the greater the interest of respondents on news stories. For more see Table 10 below.

Respondents' interest in true news is positively correlated with accuracy and previous knowledge of news stories, as assessed by Pearson's correlation in Table 10. The relationship between interest and accuracy classifying news is characterized by a high degree of positive correlation ($r = .708, n = 20, p = .000$). So, the higher respondents' interest in true news, the greater the correct classification of news as true. Moreover, interest is also positively correlated with respondents' prior knowledge of news stories ($r = .569, n = 20, p = .009$). This moderate degree of correlation suggests that an increase on interest in news stories indicates an increase in respondents' previous awareness of it.

Table 10*True News - Pearson's Correlation Between Accuracy and Other Features*

		<i>Accuracy</i>	<i>Knowledge</i>	<i>Comprehension</i>	<i>Use of Technical Terms</i>	<i>Interest</i>	<i>Vagueness</i>
Accuracy	Pearson Correlation	1.000	0.552**	-0.006	0.175	0.708**	0.012
	Sig. (2-tailed)		0.009	0.980	0.449	0.000	0.960
	N	21	21	21	21	20	20
Knowledge	Pearson Correlation	0.552**	1.000	0.284	0.083	0.569**	-0.101
	Sig. (2-tailed)	0.009		0.211	0.720	0.009	0.673
	N	21	21	21	21	20	20
Comprehension	Pearson Correlation	-0.006	0.284	1.000	-0.408	-0.053	-0.441
	Sig. (2-tailed)	0.980	0.211		0.066	0.826	0.051
	N	21	21	21	21	20	20
Use of Technical Terms	Pearson Correlation	0.175	0.083	-0.408	1.000	0.267	-0.045
	Sig. (2-tailed)	0.449	0.720	0.066		0.256	0.850
	N	21	21	21	21	20	20
Interest	Pearson Correlation	0.708**	0.569**	-0.053	0.267	1.000	0.059
	Sig. (2-tailed)	0.000	0.009	0.826	0.256		0.805
	N	20	20	20	20	20	20
Vagueness	Pearson Correlation	0.012	-0.101	-0.441	-0.045	0.059	1.000
	Sig. (2-tailed)	0.960	0.673	0.051	0.850	0.805	
	N	20	20	20	20	20	20

** . Correlation is significant at the 0.01 level (2-tailed).

4.2.3.2. FALSE NEWS

As mentioned before, true and false news were analyzed separately. False news Pearson's correlation is displayed in Table 11.

Regarding respondents' accuracy classifying false news, Pearson's correlation revealed a low degree of negative correlation between accuracy and use of technical terms ($r = -.498, n = 21, p = .022$). Therefore, an increase in accuracy classifying false news indicates a decrease in the use of technical terms.

When examining respondents' previous knowledge of news in the study, Pearson's correlation was statistically significant both in relation to respondents' interest in the news and to vagueness of news

pieces, as indicated by Table 11. Pearson's correlation assessed a moderate degree of positive correlation between previous knowledge of false news and interest ($r = .513, n = 20, p = .021$). So, the greater the awareness of false news, the greater the respondents' interest in the news stories. Moreover, there is low degree of negative correlation between previous knowledge of false news and vagueness ($r = -.471, n = 20, p = .036$), which is statistically significant. Therefore, an increase in false news awareness indicates a decrease in vagueness perceived by respondents.

Pearson's correlation assessed a moderate degree of negative correlation between comprehension of false news and use of technical terms ($r = -.597, n = 21, p = .004$). Thus, the higher a respondent rates ease of comprehension of the news, the lower he rates use of technical terms in the pieces of news.

Regarding respondents' perception of use of technical terms in false news, Pearson's correlation indicated that it was moderately positive correlated with respondents' interest in the news stories ($r = .613, n = 20, p = .004$). This relationship was statistically significant, and therefore an increase in considered use of technical terms indicated an increase in respondents' interest on the news.

Table 11*False News - Pearson's Correlation Between Accuracy and Other Features*

		Accuracy	Knowledge	Comprehension	Use of Technical Terms	Interest	Vagueness
Accuracy	Pearson Correlation	1	-0.267	0.296	-0.498*	-0.156	0.213
	Sig. (2-tailed)		0.243	0.192	0.022	0.513	0.367
	N	21	21	21	21	20	20
Knowledge	Pearson Correlation	-0.267	1	-0.023	0.403	0.513*	-0.471*
	Sig. (2-tailed)	0.243		0.920	0.070	0.021	0.036
	N	21	21	21	21	20	20
Comprehension	Pearson Correlation	0.296	-0.023	1	-0.597**	-0.462*	-0.376
	Sig. (2-tailed)	0.192	0.920		0.004	0.040	0.102
	N	21	21	21	21	20	20
Use of Technical Terms	Pearson Correlation	-0.498*	0.403	-0.597**	1	0.613**	-0.106
	Sig. (2-tailed)	0.022	0.070	0.004		0.004	0.656
	N	21	21	21	21	20	20
Interest	Pearson Correlation	-0.156	0.513*	-0.462*	0.613**	1	0.042
	Sig. (2-tailed)	0.513	0.021	0.040	0.004		0.859
	N	20	20	20	20	20	20
Vagueness	Pearson Correlation	0.213	-0.471*	-0.376	-0.106	0.042	1
	Sig. (2-tailed)	0.367	0.036	0.102	0.656	0.859	
	N	20	20	20	20	20	20

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

According to Pearson's correlation, the only similar relationship both in true and false news stories is the one between respondents' previous knowledge and interest in news stories. In this way, an increase in survey participants previous awareness of the news leads to an increase in their interest in the news, whether considering true ($r = .569, n = 20, p = .009$) or false ($r = .513, n = 20, p = .021$) news stories.

4.3. DISCUSSION

By conducting this study it was possible to have a better understanding of factors behind spread of false news.

Results of the one-way ANOVA, $F(1,40) = 10.400, p = .003$), evidence that the fact that a piece of news is true or false really impacts respondents' accuracy identifying veracity of the content. The T-test supports this evidence, suggesting that when the news presented to respondents were false, they categorized it more correctly; $t(40) = 3.24, p < .003$. The studied population of Portuguese nationals scored a higher accuracy categorizing false news ($M = .72, SD = .18$) than true news ($M = .54, SD = .17$).

The news story topic was also considered significant in accurately classifying falsehood of news. On the one hand, the results of the MANOVA conducted suggest that the topic of news has an effect on how news are classified accurately as true or false, $F(6, 35) = 2.957, p = .019$. However, this analysis of MANOVA can be considered weak since Science and Culture are the only two categories in a total of seven where the relationship is strong. Therefore, it is not clear if this significance is caused by the effect of the covariates. On the other hand, a descriptive analysis of study results reveal that respondents behaved distinctly classifying falsehood of different categories.

In the Portuguese nationals sample under study, accuracy was related with how individuals perceive pieces of news they encounter. This relationship was different in true and false pieces of news. According to Pearson's correlation, an increase in respondents' accuracy classifying true news stories indicated an increase in their prior knowledge of the news and an increase in participants' interest on the news. In false news, an increase in accuracy classifying news stories suggested a decrease in the perceived use of technical terms. According to Pearson's correlation, higher previous knowledge of false news indicated greater interest and a lower perception of news pieces as vague and abstract. An increase in comprehension rate of false news indicated both a decrease in perceived use of technical terms and in interest. Additionally, a higher use of technical terms in false news indicated greater interest on news headlines. Moreover, both in true and false news a higher previous knowledge of news pieces led to higher interest on it.

Information gathered in the survey about individuals' background allowed us to study if academical and professional areas of expertise impacted accuracy classifying news as true or false. A descriptive analysis evidenced that STEM and non-STEM respondents behave distinctly: respondents with STEM backgrounds ($M = .63, SD = .20$) classified more accurately pieces of news presented than respondents with non-STEM backgrounds ($M = .62, SD = .21$), even though overall difference was not significant.

5. CONCLUSIONS

This thesis aimed to identify whether individuals with different backgrounds reveal a different sensitivity to different news topics.

The main findings show that no one is immune to believe in false news regardless of age, level of education or area of expertise.

The first research question aimed to study if the fact that a piece of news is true or false influences individuals identifying accurately its veracity. This study shows that overall individuals classify more accurately false news than true news. The second research question aimed to study if a category of a piece of news has an impact on how individuals classify it with accuracy as true or false. It was evidenced that people react with more or less sensitivity to falsehood depending on the news topic. The categories that study participants classified more accurately were Science, Society and Economy. The third research question aimed to study whether an individual's background influences his sensitivity to false news. It was possible to conclude that participants with a STEM background were able to classify news more accurately than respondents with a non-STEM background.

While the sample limits the generalizability of results, this approach provides new insights into how Portuguese people perceive false news. This thesis complements a critical literature review with a survey, which we expect will raise awareness on how Portuguese people react to false news and provide additional information to the general population and to anyone interested on the study of fake news.

6. LIMITATIONS AND RECOMMENDATIONS FOR FUTURE WORKS

The findings in this study have to be seen in the light of some limitations. First, the possibility of a sample bias to which the results could be subject to. The diversity of the sample of participants gathered represents only a fraction of the Portuguese population, mostly from the Lisbon area. This results in profiles of Portuguese individuals mostly from Lisbon and therefore could underestimate the impact of false news in the Portuguese population. Additionally, since the study had to be done using an online questionnaire instead of being applied in-person to a group of STEM and non-STEM respondents, it can be difficult to infer the veracity of some answers. That makes the study expensive, time consuming and therefore difficult to replicate.

The second limitation concerns the size of the sample ($N = 194$). The larger the sample, the more precise are study results. A similar study with a bigger sample may have a greater accuracy.

The third limitation concerns the attention check (Appendix G). It was considered too conservative and could mislead respondents who would read the first part - *Where do you stand in terms of political orientation? Political orientation is a system that characterizes different political positions in relation to each other* - and believed to have understood the question, answering immediately. Thus, the second part – *So that we know you are paying attention and are reading this information, leave this question blank* - would go unnoticed and trick respondents. The attention check was left blank by 113 respondents and answered by 81. Due to reasons mentioned earlier and in order to have a larger number of responses, the attention check was not utilized to clean the data. In future research of this nature, we suggest a clearer attention check for respondents, and one that is less conservative.

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8. APPENDIX

Appendix A

Survey Welcome Message



Questões Iniciais

Bem-vindo a este questionário.

O presente questionário está integrado no desenvolvimento de uma tese de Mestrado da Nova Information Management School (NOVA IMS).

O questionário tem como objectivo caracterizar a percepção dos portugueses em relação a diferentes temas de notícias, e tem a duração de aproximadamente 7 minutos.

Para participar neste questionário é necessário que seja maior de 18 anos e que seja português, ou fale português fluentemente.

Não há qualquer risco associado a responder às questões do questionário.

As suas respostas são completamente anónimas e confidenciais, e serão utilizadas apenas para fins académicos.

Para qualquer dúvida, não hesite em contactar a aluna responsável, Francisca Lima de Barros, via o seguinte email: m20180400@novaims.unl.pt.

Obrigada pela sua participação!

Aceito participar neste estudo e declaro que tenho 18 anos ou mais.

Appendix B

Respondents' Profession

	<i>n</i>	<i>%</i>
Student	65	33.5
Engineer	12	6.2
Teacher	12	6.2
Retired	6	3.1
Manager	5	2.6
Consultant	4	2.1
None	4	2.1
Account Manager	3	1.5

Architect	3	1.5
Civil Engineer	3	1.5
Electrical Engineer	3	1.5
Journalist	3	1.5
Jurist	3	1.5
Marketing	3	1.5
Project Manager	3	1.5
Unemployed	3	1.5
Administrative Technician	2	1.0
Diplomat	2	1.0
Education Assistant	2	1.0
Finance Intern	2	1.0
Insurance Agent	2	1.0
IT Technician	2	1.0
Lawyer	2	1.0
Researcher	2	1.0
Tourism Technician	2	1.0
Actress	1	0.5
Analyst	1	0.5
Banker	1	0.5
Barman	1	0.5
Biomedical Engineer	1	0.5
Chemical Engineer	1	0.5
Communications and Marketing	1	0.5
Community Development Technician	1	0.5
Data Scientist	1	0.5
Designer	1	0.5
Doctor	1	0.5
E-Maritime Systems Engineer	1	0.5
Entrepreneur	1	0.5
Financial Analyst	1	0.5
Football Coach	1	0.5
Geological Engineer	1	0.5
Higher Technician	1	0.5
Hotelier	1	0.5
Human Resources Manager	1	0.5
IT Analyst	1	0.5
Kitchen Assistant	1	0.5
Legal Consultant	1	0.5
Management Controller	1	0.5
Managing partner	1	0.5

Mathematician	1	0.5
Mother	1	0.5
Osteopath	1	0.5
Professor	1	0.5
Psychologist	1	0.5
Publicist	1	0.5
Religionist	1	0.5
RPA Consultant	1	0.5
Sales Director	1	0.5
Software Engineer	1	0.5
SQA Engineer	1	0.5
System Administrator	1	0.5
Technical Director	1	0.5
Telecommunications Engineer	1	0.5
Tourist Guide	1	0.5
Translator	1	0.5
Treasurer	1	0.5

Appendix C

Student Respondents' Area of Specialization

	<i>n</i>	<i>%</i>
Business	14	21.5
Health	10	15.4
Engineering	9	13.8
Law	5	7.7
Marketing	4	6.2
None	4	6.2
Architecture	3	4.6
Arts	2	3.1
Communication	2	3.1
Data Science	2	3.1
Information Management	2	3.1
Philosophy and Theology	2	3.1
Psicology	2	3.1
Biology and Geology	1	1.5
International Relations	1	1.5
Psychomotor Rehabilitation	1	1.5
Social Services	1	1.5

Appendix D

Respondents' Profession

	<i>n</i>	<i>%</i>
Education	16	12.4
IT	9	7.0
None	7	5.4
Marketing	5	3.9
Energy	3	2.3
Finance	3	2.3
Health	3	2.3
Management	3	2.3
Retirement	3	2.3
Tourism	3	2.3
Agriculture	2	1.6
Architecture	2	1.6
Commercial Area	2	1.6
Consulting	2	1.6
Consumer Goods	2	1.6
Hotel Business	2	1.6
Housing	2	1.6
Information Systems	2	1.6
Insurance	2	1.6
Law	2	1.6
Technology	2	1.6
Telecommunications	2	1.6
Unemployed	2	1.6
Administration	1	0.8
Advisory	1	0.8
African Issues	1	0.8
AI	1	0.8
Art	1	0.8
Audit	1	0.8
Banking	1	0.8
Bar	1	0.8
Biology	1	0.8
Catering Industry	1	0.8
Civil Engineering	1	0.8
Claims Area	1	0.8
Clinic Psychology	1	0.8
Communication	1	0.8

Diplomacy	1	0.8
Economic Journalism	1	0.8
Electricity Sector	1	0.8
Energy Sector	1	0.8
Engineering Projects	1	0.8
European Affairs	1	0.8
Food Retail	1	0.8
Graphic Design	1	0.8
Industrial Optimisation	1	0.8
International	1	0.8
International Relations and Foreign Policy	1	0.8
Investment	1	0.8
IT Security	1	0.8
Logistics	1	0.8
Maritime Sector	1	0.8
Media	1	0.8
Mother	1	0.8
Museology	1	0.8
Office Automation	1	0.8
Patents and Copyright	1	0.8
Pharmacy	1	0.8
Planning and Management Control	1	0.8
Projects and Construction	1	0.8
Psychology	1	0.8
Public Administration	1	0.8
Real Estate	1	0.8
Religious Profession	1	0.8
Road Infrastructures	1	0.8
Secretariat	1	0.8
Social	1	0.8
Sport	1	0.8
Statistics	1	0.8
Sustainability	1	0.8
Tourism Promotion	1	0.8

Appendix E

MANOVA – Multi-Comparisons Effect of Category of News on Accuracy

(I) Category	(J) Category	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Science	Culture	0.29	0.10	0.08	-0.02	0.59
	Health	0.25	0.10	0.18	-0.06	0.56
	Sport	0.28	0.10	0.10	-0.03	0.59
	Economy	0.06	0.10	0.99	-0.25	0.37
	Society	0.05	0.10	1.00	-0.26	0.36
	Politics	0.17	0.10	0.63	-0.14	0.48
Culture	Science	-0.29	0.10	0.08	-0.59	0.02
	Health	-0.04	0.10	1.00	-0.35	0.27
	Sport	-0.01	0.10	1.00	-0.31	0.30
	Economy	-0.22	0.10	0.29	-0.53	0.08
	Society	-0.24	0.10	0.22	-0.55	0.07
	Politics	-0.12	0.10	0.88	-0.43	0.19
Health	Science	-0.25	0.10	0.18	-0.56	0.06
	Culture	0.04	0.10	1.00	-0.27	0.35
	Sport	0.03	0.10	1.00	-0.28	0.34
	Economy	-0.19	0.10	0.50	-0.49	0.12
	Society	-0.20	0.10	0.41	-0.51	0.11
	Politics	-0.08	0.10	0.98	-0.39	0.23
Sport	Science	-0.28	0.10	0.10	-0.59	0.03
	Culture	0.01	0.10	1.00	-0.30	0.31
	Health	-0.03	0.10	1.00	-0.34	0.28
	Economy	-0.22	0.10	0.32	-0.53	0.09
	Society	-0.23	0.10	0.25	-0.54	0.08
	Politics	-0.11	0.10	0.91	-0.42	0.19
Economy	Science	-0.06	0.10	0.99	-0.37	0.25
	Culture	0.22	0.10	0.29	-0.08	0.53
	Health	0.19	0.10	0.50	-0.12	0.49
	Sport	0.22	0.10	0.32	-0.09	0.53
	Society	-0.02	0.10	1.00	-0.32	0.29
	Politics	0.10	0.10	0.94	-0.20	0.41
Society	Science	-0.05	0.10	1.00	-0.36	0.26
	Culture	0.24	0.10	0.22	-0.07	0.55
	Health	0.20	0.10	0.41	-0.11	0.51
	Sport	0.23	0.10	0.25	-0.08	0.54
	Economy	0.02	0.10	1.00	-0.29	0.32

	Politics	0.12	0.10	0.89	-0.19	0.43
Politics	Science	-0.17	0.10	0.63	-0.48	0.14
	Culture	0.12	0.10	0.88	-0.19	0.43
	Health	0.08	0.10	0.98	-0.23	0.39
	Sport	0.11	0.10	0.91	-0.19	0.42
	Economy	-0.10	0.10	0.94	-0.41	0.20
	Society	-0.12	0.10	0.89	-0.43	0.19

Appendix F

Score of Six Features for Each Piece of News

Type	Category	News	Acc.	Know.	Compr.	Tec.Ter.	Int.	Vag.
True	Science	The closest black hole to our planet, which is a thousand light years away from Earth, has been discovered.	0.68	0.36	4.53	3.44	4.02	2.91
False	Science	A study by Harvard scientists concludes that carrying weapons reduces crime.	0.82	0.14	4.65	2.13	3.75	3.80
True	Culture	In 2017, 200 thousand euros of public funds were spent to promote the tauromaquia culture so that it could be classified as Immaterial Cultural Heritage of Portugal under the UNESCO Convention.	0.50	0.21	4.59	2.93	3.73	2.61
False	Culture	Leo Fender, the creator of the well-known Fender guitars, was a talented guitarist.	0.47	0.15	5.50	2.02	2.29	2.55
True	Health	The Constitution of the Portuguese Republic does not allow mandatory hospitalization in case of contagious diseases.	0.58	0.44	4.70	2.53	4.40	2.78
False	Health	Between 1950 and 2020, China was at the origin of nine different epidemics - H2N2, H3N2, H5N1, SARS, avian flu, swine flu, swine fever, Coronavirus, Covid-19.	0.47	0.44	4.55	4.11	4.18	2.73
True	Sport	Following Football Leaks, Manchester City was suspended for two years from Champions League.	0.47	0.42	5.14	3.00	3.16	2.77
False	Sport	According to the British newspaper Daily Mail, FC Porto is third in the list of the most corrupt clubs in European soccer.	0.73	0.14	5.10	2.10	3.07	3.24
True	Economy	Social Security paid 4 million euros to pensioners already deceased.	0.53	0.29	5.23	2.30	3.91	2.86
False	Economy	Nelson de Sousa, Minister of Planning, is correct in saying that Portugal is a leader in the execution of European funds.	0.77	0.12	3.70	3.21	3.30	4.00
True	Society	Jair Bolsonaro supports a measure that wants to force Brazilian prisoners to bear their expenses during the time they are serving their prison sentences.	0.77	0.21	4.64	1.71	3.38	3.00
False	Society	In Portugal there has never been a condemnation for racial discrimination.	0.71	0.20	4.82	2.03	3.97	3.36
True	Politics	Graça Fonseca, Minister of Culture, went to give a speech to Santa Casa da Misericórdia a day after her company signed a 19,600€ contract with the institution.	0.39	0.21	4.55	1.76	-	-
False	Politics	André Ventura denies that Chega is a racist party, given that in the Lisbon District Organ there are two black women dealing with cleaning.	0.83	0.11	4.98	1.52	-	-

True	Science	A study by the Faculty of Medicine of the University of Coimbra and the Nova Medical School indicates that two out of three Portuguese adults are vitamin D deficient.	0.79	0.32	5.04	2.57	3.78	2.54
False	Science	The FBI has released a list of the Zodiac signs most likely to commit crimes.	0.90	0.08	5.09	1.98	1.70	3.98
True	Culture	None of the Beatles' elements could read or write music on the staff.	0.32	0.24	5.02	1.98	2.82	2.80
False	Culture	José Saramago said "Portugal doesn't have right-wing, left-wing parties, it has a bunch of scoundrels who gather to steal together".	0.48	0.19	4.45	1.94	2.26	3.11
True	Health	In the Philippines, a baby with only 29 days is the youngest victim in the world to die because of Covid19.	0.58	0.35	5.24	1.82	3.60	2.47
False	Health	Drinking one glass of red wine a day is equivalent to doing one hour of physical exercise.	0.90	0.27	5.24	1.44	2.80	3.29
True	Sport	Dejan Lovren, a Liverpool player, argues that Covid19 is being propagated to force the world's population to vaccinate themselves with drugs that are going to implant microchips.	0.29	0.13	4.35	2.50	2.15	3.59
False	Sport	UEFA suggests that the allocation of places in European soccer competitions in 2019/20 be made in accordance with last season's final classification.	0.66	0.21	4.55	2.27	2.45	2.98
True	Economy	The proposed amendment to the State Budget made by PSD which provided for a 21.7% reduction in ministerial office expenses was rejected.	0.58	0.16	4.56	3.28	4.09	2.74
False	Economy	In Portugal, the average amount of the Social Integration Income benefit is fixed at around 800 euros.	0.87	0.24	4.48	3.18	3.57	2.48
True	Society	An IPSS in São Pedro do Sul was fined for providing support to six more people than was authorized.	0.52	0.10	4.68	2.49	2.83	2.98
False	Society	The Lidl supermarket chain offers 500€ shopping cards to anyone who answers an online questionnaire.	0.94	0.35	5.09	1.52	3.11	2.52
True	Politics	Despite not having political representation in the Portuguese Parliament, Livre will continue to receive a public subsidy of 165 thousand euros per year during this legislative term.	0.56	0.27	4.39	3.09	3.89	2.61
False	Politics	In 2015 the PSD Government recorded the highest public deficit ever at 10.9%.	0.61	0.15	4.28	3.35	3.87	2.72
True	Science	A study led by Columbia University (USA) warns that in some places on the planet global warming is generating combinations of humidity and heat that can be potentially fatal to humans.	0.77	0.20	4.66	2.69	4.47	3.69
False	Science	In February 2020, 500 scientists signed a letter to the UN arguing that there is no climate emergency.	0.74	0.20	4.68	2.58	4.26	3.68
True	Culture	Bruce Springsteen's "Born in the USA" was the first CD to be produced in the United States.	0.32	0.05	5.44	2.53	2.94	2.34
False	Culture	Black Friday had its roots in slavery since in the last Friday of November black slaves were sold at a discount in order to boost the economy.	0.89	0.17	5.16	2.65	3.35	2.84
True	Health	In October 2019 an event in New York City brought together several international entities to analyze how they would respond to the outbreak of a global pandemic.	0.36	0.21	4.84	2.19	3.91	3.69

False	Health	The medication against depression results in side effects that imply new substances to compensate the effects of the previous ones, creating a vicious cycle of medicinedependence.	0.32	0.26	4.29	3.48	3.77	3.65
True	Sport	The total number of FC Porto victories in the Champions League is more than double the number of victories of SL Benfica.	0.39	0.18	5.10	2.61	2.48	2.71
False	Sport	Benfica won the 2018/19 Portuguese league with a total of 103 goals. This was the first time a team scored more than 100 goals during the championship.	0.48	0.27	5.38	2.47	2.53	1.97
True	Economy	In Portugal, women's wages are on average 14.5% lower than men's.	0.86	0.64	5.28	2.81	4.66	2.94
False	Economy	Joseph Stiglitz, winner of the Nobel prize for economics, says that if Portugal does not leave the Euro, "it is condemned.	0.71	0.23	4.48	2.42	3.88	3.91
True	Society	The Covilhã municipality acquired and offered thermographic cameras worth 4 thousand euros to institutions that are on the front line against Covid 19, which cannot be used to measure the temperature of people.	0.50	0.17	4.13	3.66	3.63	2.78
False	Society	Greta Thunberg has publicly lied about her age.	0.98	0.09	5.75	1.63	1.91	3.28
True	Politics	The Minister of the Environment, João Matos Fernandes, lied about the loss of European funds due to the suspension of the Lisbon's circular subway line.	0.59	0.27	4.19	3.00	3.69	3.66
False	Politics	Decriminalizing euthanasia was not part of any of the portuguese parties electoral program in the 2019 parliamentary elections.	0.71	0.50	5.03	3.06	4.55	2.65

Appendix G

Survey Attention Check



Onde se posiciona em termos de orientação política?

A orientação política é um sistema que caracteriza diferentes posições políticas em relação umas às outras.

Para sabermos que está a tomar atenção e está a ler esta informação deixe esta questão em branco.

Esquerda	Ao centro	Direita
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

