

Dimensions of Fake News

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Abstract - “Fake news” has become a common buzzword in public, political, and scientific debates. Whereas the definition of the term and its political consequences are often highlighted, this paper seeks to provide an overview of the development, the most common dimensions of fake news, and their mode of action. Research shows that fake news can trigger and act in conjunction with numerous effects that influence recipients. A comprehensive overview of these effects is given in this paper.

Keywords - *fake news; social media; misinformation; disinformation.*

I. INTRODUCTION

In 1835, the New York Sun published a story by Richard Adam Locke saying that the renowned astronomer Sir John Herschel discovered life on the moon. The story was published for a few days with new information about the discovery including the geography, lunar vegetation, and the inhabitants: bat-people. The story was reprinted by other papers and the New York Sun’s circulation increased from about 4.000 daily sales to 19.000 [1]. Of course, the Great Moon Hoax was made up by Locke without the knowledge of Herschel who was not amused to see his name used [2]. Locke later explained that he intended to write a satire and never meant it to be a hoax; his goal was to mock the gullibility of Americans and their belief in extraterrestrial life [2]. Locke’s famous news stunt would probably be called fake news today. In recent history, the term “fake news” is heavily associated with the emergence of social media or the role it played in the 2016 US general election [3]. Since the incident at a press conference in the White House on February 16, 2017, when the then President Donald Trump called CNN media representatives “fake news”, refusing to allow any questions, the term has become a hot topic in the scientific discussion about modern and social media [4]. However, the frequent use and popularity of the term led to a more and more blurred understanding and vastly different interpretations among scholars and the general population, leaving it unclear as to what is considered fake news [5]. It is further unclear what mechanisms of action of fake news are prevalent in social media.

In order to grasp fake news as a whole, a comprehensive understanding of the associated mechanisms and dissemination methods is important. Above all, this is necessary to recognize all aspects and occurrences of false

and misinformation in social media. This work aims to provide a uniform view and to deliver a basic systematization of all dimensions of fake news and its prevalence in modern media.

The rest of the paper is structured as follows. In order to classify the fuzzy concept of fake news, we will present the historical development of the term fake news in Section 2. In Section 3, we will discuss the methodology used to capture all dimensions of the phenomenon of fake news. We will present the results of a comprehensive literature and study analysis and characterize a total of 28 dimensions of fake news. In the final section, we evaluate the dangers of fake news, classify the results of this study, and provide an outlook for future studies.

II. THE DEVELOPMENT OF FAKE NEWS

The term “fake news” was recorded in lexicons in the USA as early as the late 19th century. Prior to that, the term “false news” was used [6]. Originally used to refer to made-up or false news [7], today the term “fake news” is also used to refer to false news on social media, to undermine work by news outlets [8] [9] or to describe fabricated news in satirical contributions [10]. Fake news is often described as intentionally deceptive [3][11]. Other sources also acknowledge the possibility that the dissemination of fake news may also happen unintentionally [6][12]. Apart from the pure intention to deceive, other motivations, such as political ideologies or financial goals, are sometimes also attributed to creators of fake news [3]. Similarly, some sources define fake news as being written in a way that has news characteristics [9][13]. For some authors, online dissemination is an important aspect of fake news [14] or even a characteristic of it [15], while other sources do not pay particular attention to it [6]. Some definitions require fake news to be completely false, i.e., to have no basis of fact underneath [3][16], which raises the issue of classifying half-truths and manipulating the context with a “core of truth”. Tandoc et al. address this problem by distinguishing high and low levels of “facticity” [9]. Another approach to the argument is to call something “fake news” only if the intended deception has succeeded, otherwise, it is just fiction [9]. In a contrasting theory, fake news does not necessarily have to be believed in order to be considered as such [17]. In contrast to lies, fake news has less socially motivated

purposes, such as protecting oneself or avoiding harm, but rather serves those who create it to achieve financial or political goals or to promote themselves [18].

It becomes clear that the definition of the term determines the time of recognition and what is counted as fake news; therefore, historical examples or its different types and sub-categories vary. In this work, the term fake news refers to the deliberate dissemination of erroneous information by the creator with the intent to deceive.

Examples of fake news could be documented in the pre-printing press era. While the invention of the printing press and the spread of literacy helped the spread of knowledge, it also resulted in its monetization [19]. Information became a commodity that could be produced, published, and sold in a high number of copies. Through the 17th century in France, false stories became very popular on printed broadsides: the so-called “canards” [19]. Progressing in history, mass media and the press have had an important role in the spread of hoaxes.

Fake news today differs from the historical examples due to the instant and global distribution through the new media and the “systemic ways in which fake news mobilizes our cognitive biases and heuristics” [20]. The motivations did not change, but they increased on a global level: young Macedonian people spreading fake news for the US election 2016 with no other interest than money, Donald Trump defining established mainstream media as “fake news” or the famous so-called “pizzagate” conspiracy theory which culminated in a shooting [10][20][21]. Spreading real or fake news through online media and social networks led to an enormous amount of information, making it more difficult to classify its validity. In addition, producers of fake news make use of the design of established news sources disguising their origin and intent [8]. Therefore, the consequences of fake news combined with social media are toxic and explosive because they make it possible for the creator to target an audience specifically and manipulate cognitive biases [20][22]. These dimensions of fake news, which can be direct effects of fake news or work in conjunction with them, are described next.

III. THE DIMENSIONS OF FAKE NEWS

To obtain information on the development and impact of fake news, first, a broad literature search was conducted via Google Scholar using the search terms “fake news” and “fake news effects”. Since this search term delivers over half a million search results, the search was further narrowed down to results that deal with fake news and its effects on people. After reviewing over 500 articles, 28 different effects or mechanisms of action could be identified. To examine these more closely, a snowball and depth-first search was then carried out for each effect.

The creators of fake news often use various mechanisms or effects that work in conjunction with fake news and can make false information more effective for the recipient, amplify existing effects or immunize against counterarguments. These dimensions can be used by the creators of fake news. However, some dimensions that can play a significant role in the effectiveness of fake news are

not necessarily used purposefully. Instead, these can result from the recipient's environment or handling of fake news. In TABLE I, common influential dimensions and effects in conjunction with fake news are listed and explained in alphabetical order according to their most common name (if available).

TABLE I. DIMENSIONS OF “FAKE NEWS”.

Dimension	Explanation
Astroturfing	Astroturfing is an attempt to convey an incorrect impression of public opinion, e.g. by feigning that a large majority of people is in favor of a certain decision. In contrast to a “grassroots movement”, however, the population is not actually behind it, but it is organized by a covert initiator [23]–[27]. Even though it is not a new phenomenon [28], astroturfing can spread more effectively by means of the Internet [29][30].
Availability Cascade	Individuals tend to adopt the views of others when those views gain popularity in their social environment [31]–[33]. Informational cascades and reputational cascades can make this possible through different motivations and may occur together [32].
Availability heuristic	The probability of events is measured by how available a similar event is in memory. So a recent or frequent reporting of certain events ensures that they are considered more likely [34]–[40]. This also applies if these reports are purely thought-provoking [41].
Backfire effect	It was found that subjects believed even more strongly in the original, incorrect information after it had been corrected [42][43]. It is assumed that this effect only occurs in specific situations, since it could not be proven with another experimental setup [44]–[47]. If judgements are formed immediately during reception, backfire effects can be reduced [48]. Research suggests that emotions may be relevant in this process [49]. Additional research is needed [50]. This can also be called “boomerang effect” [51][52].
Bandwagon effect	This refers to the assumption that if other people perceive something as good, it will also be judged good by oneself [53]–[55]. Own opinions are formed on the basis of other people's opinions. This phenomenon has also been observed in online reviews, for example [55][56].
Clickbait	Information gaps created by news titles arouse the potential reader's curiosity for the rest of the article. Often a forward reference is used, which refers to further information in the article [57]–[59]. This may increase the readership of an article but does not necessarily have further negative effects [60].
Confirmation bias	People unconsciously prefer information that coincides with their own opinion. If it does, they consider it more credible [61]–[66]. It is suspected that this contributes to the emergence of echo chambers and filter bubbles [67].
Conservatism bias	This refers to the tendency of individuals to inadequately adjust their attitudes when

	confronted with new information [64][68]–[70]. Thus, if a person already believes in fake news, their beliefs are difficult to correct.	Implied truth effect	If other news is recognized or labeled as fake news, but one is not, it is more likely to be considered true [122]. However, this effect may be small [123].
Continued influence effect	Even the negation and correction of incorrect original information usually cannot completely reverse its effect. It continues to influence the recipient [71]–[76], even when warnings are given [77]. This effect is weakened if instead of a simple correction a suitable alternative explanation for a scenario is offered [78]. Partly this may be because recipients do not accept a correction [79]. This is also called "belief perseverance" [70][80].	Informational cascade	People who lack complete information on a subject may rely on the perceived beliefs of others [32][124]–[126]. A decision is made based on the decisions of others, even ignoring personal knowledge, expecting the crowd to be right. This is called an "informational cascade" or "information cascade". This way, fake news can be propagated through a network. The strength of ties of a person to the other people in their group may influence their decision-making behavior [127]. Self-corrections by further cascades are possible [128].
Echo chamber effect	If users mainly interact with other users or institutions that have a similar opinion to their own, an echo chamber is created. The users thus reinforce each other's opinions [81]–[83]. The confirmation bias works in a similar way. Often, however, users are not completely isolated, but continue to be confronted with opposing content, especially online [84]–[87]. Thus, this effect may not be as strong as initially perceived.	Misdirecting	Misdirecting is employed when contextual hashtags are used in social media, but a completely different topic is being reported on [129]. To do this en masse, social bots can be used. This distracts from the actual topic and actual information is lost in the amount of news [130]. In another study, this could not be detected [131].
Emotional memory enhancement	Emotionally charged information is better retained than neutral information [88]–[92]. Suggestion has an even stronger effect than pure emotionality [92].	Misinformation effect	Untruthful reporting following an event damages the correct memory of that event [132]–[137]. Later corrections may be able to reduce that effect [138].
Filter bubble	This term refers to information bubbles that are created in social media in particular and in which algorithms select or pre-filter content that is then displayed to the user. This content often corresponds to existing interests. Users are often unaware of the filter bubble [93]–[97]. Thus, no contrary opinions are displayed that could invalidate fake news. This effect is similar to echo chambers. It is still debated whether filter bubbles exist and are problematic as some evidence points against it [87][95][98][99].	Negativity bias	People have a tendency to give more weight to negative information than to positive information [66][139]–[144].
Framing effect	Small changes in context or in the way information is conveyed can lead to a major change in decision-making behavior [100]–[102]. Emotions may be an important aspect of this [103][104]. The effect of framing can be reduced through warnings [105][106].	Primacy effect & Recency effect	Information that a recipient takes in first has a stronger impact on them than the information that follows (primacy effect). Likewise, the information received last remains in the memory longer (recency effect) [145]–[149]. The primacy effect may be stronger than the recency effect [147]–[150].
Google effect	People tend not to remember information in itself, but instead where it can be found when needed [107][108]. Thus, insufficient background knowledge of a person might not be enough to counter fake news.	Reputational cascade	Like with the informational cascade, people base their decisions on the decisions of their peers. However, here they do so regardless of their own thoughts because they are motivated to earn social approval and avoid disapproval [32][151][152]. Because of the perceived social pressure, this cascade may be more resilient than informational cascades [153].
Hostile media effect	Biased subjects feel disadvantaged by media coverage, even if a large proportion of recipients perceive it as appropriate [109]–[114]. The disadvantage is perceived to be unfavorable of one's own opinion. This may reduce belief in the correction of fake news by major news outlets.	Reputation heuristic	Instead of checking the content of a source's information, the source itself is checked for credibility. If the source has a good reputation or is considered credible, the information is more likely to be believed [73][154]–[157]. If fake news creators succeed in imitating a credible source, their credibility increases.
Illusory truth effect	Statements that are heard several times are attributed a higher truth value than statements that are heard for the first time [115]–[118]. This means that repetition increases the probability that a statement will be considered true. This is true even if the plausibility of the statement is low [119] or in the case of warnings against it [120]. This effect is also referred to as the "validity effect" [121].	Rumor refutation	Rumors on social media that are incorrect take longer to be resolved than true rumors. Unverified rumors are often shared earlier and reach a larger user base than resolved rumors [158][159].
		Smoke screening	Smoke screening works like misdirecting with the difference that at least similar content to a hashtag is posted [129]–[131].
		Tainted truth effect	Warnings of false information issued erroneously in relation to truthful content can damage the credibility of the truthful information [137][160][161].

Third person effect	People tend to believe that mass media influence other people more strongly than they influence themselves [162]–[167]. As a result, the influence of fake news on oneself can be underestimated.
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Human memory can be affected by internal and external influences and is not infallible [92]. The effects of fake news that operate in this context are presented in this paper. Fake news can initially be an external influence with numerous associated effects on a person's perception. How strong the impact of these effects ultimately turns out also depends on the internal circumstances of this person. While some personal characteristics may support the effect of fake news, others weaken it. The susceptibility to fake news can be influenced, for example, by a tendency toward analytical thinking [168], skeptical attitudes [168], emotions [169], frequency of media use [3], conditions of one's own networks [3][168][173], age [170], and the culture from which someone comes [171][172]. Some effects may bypass some of these factors by operating at a low cognitive level [168].

Numerous other, even previously undiscovered or unexplored internal possibilities of influence by a subject's personality or attitude may exist. Thus, in addition to further investigation of the effects of fake news, a closer look at the recipients of fake news and their circumstances also offers research potential for the future.

IV. CONCLUSION

Fake news has been with mankind for a long time and has made multiple appearances in the past. Although the phenomenon of fake news may not be new, it is crucial to understand that the latest developments are a danger to democratic societies. In this work, the basis for the understanding of various phenomena in the field of fake news is laid in order to ensure a holistic view of the topic for future research projects. Fake news can be spread particularly easily and quickly through modern technologies such as social media. Furthermore, it is evident that fake news and its impact should be considered within the respective cultural, social and political contexts [10]. This makes the dimensions with which fake news works even more relevant for current discussions, even more so when emotions are considered more valuable than facts [21]. Since it has been shown that fake news can influence a person's opinion formation in numerous ways, a danger to opinion formation in society as a whole is possible. Therefore, especially regarding the aspects of opinion formation and freedom of expression, attention should be paid to fake news and, if necessary, its spread should be curbed. The dimensions of fake news presented in this paper can be used in further work and serve as a reference standard to better classify and categorize fake news effects in social media, but also beyond. In this way, further studies could investigate which effects are particularly prevalent in the various social media.

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